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Nature in Print

By HOWARD ZAHNISER

"For the preservation of an inner serenity, a perceptively aware enjoyment of the life-experience, and a freedom from myriad worries and fusses that come from misthinking and blinkered thinking, there is nothing more effective than a steadfast remembering that we are an animal."

So writes Alan Devoe in the opening sentence of one of the thirty essays comprising his latest volume, an interesting and meaningful book entitled *Speaking of Animals.* It is an opus that stands well beside *Lives Around Us* published in 1942, and merits the expectations aroused by Mr. Devoe's earlier works, *Phudd Hill,* in 1937, and *Down to Earth,* in 1940. What makes it interesting is, of course, its presentation of the facts in the lives of the wild creatures with which it deals—an effective presentation of fascinating facts. What gives the volume its meaning is not only the value of this information, but, particularly, the importance of Mr. Devoe's reflections. Thus he sees the remembrance that man is an animal as a source of serenity and enjoyment. Thus he observes in another part of the volume that "we all carry within us certain very ancient memories." And he comments:

"It is from these profound memories, from this heritage of our ancient community and oneness with all creation and with its source, that we derive our protoplasmic conscience: a conscience deeper and stronger than any passing convention or transiently imposed morality. It is from the subliminal depths of ancient memory that we draw many a curious fear, and many a curious love, which often enough conflict disastrously with the cultural pattern of the modern civilization in which we find ourselves. And, most joyously, it is surely from the depths of Edenic memory that we are stirred and moved, as we all are, in contemplating the happy innocencies, the glad unknowing life-fulfillings, of animals."

Perhaps it is from such profound depths that we also are stirred and moved by Mr. Devoe's accounts of the life-fulfillings he chronicles in *Speaking of Animals.* Yet the volume is rich also in the more simple interests in animals. One can appreciate the sensitiveness of Mr. Devoe's description of the mole's life history as "the cycle which is the dark blind destiny of moles," but it is the sequence of incidents making up this cycle that is the subject of the essay. So also throughout *Speaking of Animals* the reader is intrigued and entertained by its author's descriptions and narratives; the engaging reflections are preludes and overtones.

Mr. Devoe explains in a foreword that the subjects of his "zoographies" have been selected for "maximum diversity." Chipmunks represent small mammals, deer the big ones. The opossum is "warm-blooded life at its lowest and sleepiest;" the hummingbird is life "most quickened and shimmering." The otter is "for symbol of animal play; beaver for symbol of building; vulture for symbol of death." And so diverse are the subjects as to include also toad, newt, turtle, water-strider, eel, dragonfly, crayfish, caddis-fly—as well as fishes, birds and mammals.

Here indeed is an interesting book, a volume through which a reader can share the rich pleasure of such an observer and thinker as Alan Devoe. There is a more, however, than simple pleasure in *Speaking of Animals.* There is a depth of satisfaction too in noting Johannes Jensen's comment that "To go to the animals is to go home," and a pleasant, satisfying assurance in Mr. Devoe's concept of unity:

"In all the diversity of animaldom, there is yet a unity. All creation is a fellowship, ourselves included. Whatever else we may be, we are profoundly brother to all white-footed mice, all newts, all herons, all coons and minks and all the rest."

Finally, there is a tonic for us in these pleasures—a refreshment much needed in what Mr. Devoe calls our "mazy intellectualisms," a medicine for our so highly mechanized existence. We need, as he says, "to revert to simple animal-sense. . . . We need the feeling, 'in our bones,' of the animal-excellence of here-and-now; and it can lead us, by a psychic-sensuous insight, to feel serenely the sense of the ever-continuum of life." If our reading and our other recreations brought us closer to satisfactions of these needs, perhaps we would be less numerous patients for psychiatrists.

There is a breath of such satisfaction in a volume that John and Jean George have recently written ostensibly for readers somewhere between the age of twelve—a story of foxes in a Potomac setting some thirty miles up the river from Washington, D. C., entitled *Vulpes: The Red Fox.* I am never a reluctant reader of children's books if their subject matter is within the fields that I like to survey, and with sons 2 and 10 and daughters 5 and 7 I have a ready excuse for spending an evening with almost any juvenile volume that comes my way. Occasionally, if forced to a confession, I should have to admit that either such a book becomes adult reading or else the reader is once more juvenile. *Vulpes* is that sort of volume, and I suspect it is so because it seems in a simple way a filling of this prescription that Mr. Devoe has written. It is a fiction narrative of what happens to Vulpes, its hero, from birth to death, and all the other characters within it—human and other—are there because of Vulpes. Someone reflects in one of its pages that "there certainly is a lot to learn in the woods. And right around here too, not thirty miles from Washington." Thus it becomes most difficult to set any proper upper age limit for readers of such a work provided they wish to "learn in the woods" and have an interest or potential interest in foxes. Indeed it may well be that in reading as well as in vacations a resort occasionally to the most simple sources of enjoyment is altogether healthful. One can, on this basis at least, congratulate any individuals who are parents and thus have the best of reasons for reading this eloquently simple and truthful work of fiction that the Georges have written.

Surely *Vulpes* is a most interesting volume for the young audience that its authors have specially invited. Much of this interest arises from the authors' adherence to all the facts of fox life as it is led in this peculiar setting. Some readers of this page will regret that the steel trap is among these facts. Some will regret that hounds and hunters are a part of the fox's world. Yet the fox of the story escapes the horror of the trap and actually participates in the sport of the hunt. Hunting is in truth an essential fact of the world here represented. Just a few pages before the dramatic end of the story, which seems as unanswerable and fittingly final as death itself, we read that—

"The night woods seemed filled with hunters. Vison, the

Hermit Thrush

By MAE WINKLER GOODMAN

Within the green cathedral
of the wood,
or from the open altar of the hill
your song soars skyward,
bell-cadenced, sweet,
almost ethereal.
Loving the pines and hemlocks,
you do not scorn
the tangled swamplands
or the grassy plains . . .
If you can sing,
what matter where you are?
Your song cascades in golden avalanche,
leaping from branch to branch . . .
from star to star!

mink, scouted the stream with a relentless fury that sent chills of terror through his hapless victims. Procyon, the raccoon, watched from his retreat in a hollow tree. After Vulpes had passed beneath him, the inquisitive Procyon descended to the ground and followed him toward the farms. Near the margin of the woods Vulpes caught the musky odor of Mephitis, the skunk. . . . Tamias, the chipmunk, and Marmota, the woodchuck, were hibernating in their burrows, but most of the animals were active. Vulpes played his part in this activity. Each was intent on securing his own food or prey. This was the normal cycle of the wild. Hunters and hunted, food or prey. . . . For the present, Vulpes was the hunter; perhaps in the morning he would become the hunted."

But there is little brooding over life in the entire volume. Rather it is vital with the sense of what Mr. Devoe called the "animal-excellence of here-and-now." The superior little pup that is Vulpes when first we read of him, the adventurous Vulpes finding his vixen Fulva on an ice-bound Potomac island, and the wise old veteran leading with zest the hounds that for years had shared in the excitement of the hunt—throughout this story the reader follows an animal that is indeed full of life.

And there is a beautiful vitality in the drawings that Jean George has created for the volume's illustrations — wash drawings in black and white, they seem to be. Whatever the medium, they are in truth works of art. Some of them have such an evanescent grace or delicacy that they seem mobile, and looking at any of them is like being outdoors in a happy mood. They alone will keep at least one copy of *Vulpes* on an adult shelf where it will not get torn, fingermarked, or stained—even if it is for the children.

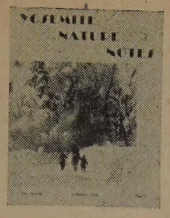
Speaking of Animals: A Book of Nature Studies. By Alan Devoe. New York: Creative Age Press. 1947. 198 pp., with 44 photographs on 24 plates. $3.

Vulpes: The Red Fox. By John L. George and Jean George. New York: E. P. Dutton & Co., Inc. 1948. 184 pp., with end-paper and 55 text drawings by Jean George. $2.50.

Psychology Textbook

Comparative Physiology. By Bradley T. Scheer. New York. 1948. John Wiley and Sons. 563 pages. $6.00.

This is a textbook designed for an advanced course in comparative zoology in college and for use by students who have a background in physics, chemistry and zoology. Physiological processes are correlated with evolutionary history and ecology, and, more important, the potentialities of the comparative method of study are exhibited. The most recent advances in the field are thoroughly covered.



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Acting upon the sentiment expressed in a resolution adopted at the Conference on Wildlife, Recreation and Related Resource Problems, held in December, 1947, J. A. Krug has appointed a new Advisory Committee on Conservation. Members of this committee are: Shirley W. Allen, Society of American Foresters; Dr. Ira N. Gabrielson, Wildlife Management Institute; Kenneth A. Reid, Izaak Walton League of America; Fairfield Osborn, New York Zoological Society; Miss Harlean James, American Planning and Civic Association; Bestor Robinson, Sierra Club; Charles Moore, Dude Ranchers' Association.

New Botany Textbook

The Essentials of Plant Biology. By Frank D. Kern. New York. 1947. Harper and Brothers. 440 pages. Illustrated. $4.00.

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About Primula

The Cultivated Species of Primula. By Walter C. Blasdale. Berkeley and Los Angeles, California. 1948. University of California Press. 284 pages. Illustrated. $7.50.

This is a book designed to interest both garden lovers and students of the plant sciences. For two decades the author, who is Professor of Chemistry, Emeritus, at the University of California, has devoted much time to the study of this genus and to the cultivation of many representatives of it in his garden. From these studies he presents a book that is at once a guide to the horticultural specialist in these plants and to the botanist.

Farming as a Business

The Business of Farming. By Herrell DeGraff and Ladd Haystead. Norman, Oklahoma. 1948. University of Oklahoma Press. 244 pages. Illustrated. $3.00.

This book is a general manual for the man who owns a farm, or who wants to do so; who wants to farm or to know why he is not doing so well at it. There are four main parts to the book dealing with soil management, equipment management, labor management and farm organization. This is a practical book that provides a measure to be applied to the successful farm.

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1948
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BRITISH RAILWAYS

AN AFFAIR OF HONOR?

By JULIA C. JAMES

It sometimes happens that we see only one act of drama in the life of the small creatures about us. In such a case, we often let our imaginations fill in the missing parts of the story. I had an experience of that kind one afternoon last summer.

As I stepped out on the porch, which is screened almost to the floor, I noticed a small black "pill" rolling around. On looking closer, I discovered that it was two ants, clinched tightly together, fighting furiously. I did not know what had caused such a fierce attack or how long it had been going on when I discovered it. However, for an hour—down on knees and elbows, and magnifying-glass in hand—I followed it round by round.

The end of each round was denoted, not by the ringing of a bell but by the amputation of a section of a leg of one or the other of the contestants. No holds were barred. They hung on to each other's legs with a bulldog grip. Presently, off would come part of a leg, setting one of the ants free. Occasionally one of them would run to the screen, where he anchored himself firmly. His opponent would pull and tug at him until he was jerked loose, leaving a leg still hooked in the screen.

In this manner the tug-of-war went on for the whole sixty minutes without a single pause. This, I thought, was to be a fight to the death. Then, abruptly, without any signal that I could detect, the battle ended.

One ant limped off and disappeared in a crack at one end of the porch. Half of his middle leg on the left side was missing. On his right side, one section of the front leg and all of the middle leg were gone. The other ant went in the opposite direction. He really hobbled out of the ring. On his left side, only half of the hind leg was missing but, on the right side, half of both the front and middle legs and the entire hind leg had been torn away!

Whole legs and pieces of legs were strewn about the floor and clamped into the meshes of the screen. As I checked on them I speculated on the reason for the onslaught and its abrupt ending.

Since the ants appeared to belong to the same species it seemed unlikely that they were fighting as members of rival tribes. Probably they were not putting on an exhibition match either, because there was not another ant in sight; besides, the battle had been too fierce for that.

I concluded that, while passing each other on their usual round of duties, one ant had hurled at the other an insult too deadly for any self-respecting ant to endure. I imagined that the culprit finally apologized for the affront, thus ending the affair of honor satisfactorily.

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I am enclosing (check, postal note) for $3.45 for which mail me postpaid my copy of the COMPLETE BOOK OF GARDEN MAGIC.

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Contents Noted

IN THE Yaqui Valley of Sonora, Mexico, irrigation projects are turning desert land into a Mexican breadbasket. Hundreds of small lakes are formed by the release of impounded waters, and great numbers of teals, mallards and geese winter there. Ciudad Obregon, which is three to four hours by air and a day's drive by automobile from Nogales, Arizona, is now a center for waterfowl gunners. Game laws in Mexico are few, and enforcement haphazard, but a license and gun permit are both recommended because the game warden, who also doubles as forestry supervisor, might come around. You can hire a small plane and go up and shoot the birds in the air, if you want. And if you tire of waterfowl you can shoot quail and white-winged doves. All this we glean from the "Sportsman's Corner", a column in the *Arizona Daily Star*, which advertises the allure of Ciudad Obregon in all seriousness. Here is one local reason why we are not sending back to the northern breeding grounds the ducks and geese that should be spared if we are to increase the continental population from its now dangerous low.

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EXTRAVAGANCE of governmental expenditure certainly should have no supporters, except, possibly, the spenders. However, economy often takes strange turns. One of the silliest and most inconsequential budget slices by the first session of Congress was that lopping off the meager $163,000 for the Division of Wildlife Management of the United States Forest Service. This division supervised the wildlife resources on 170 million acres of land, resources including one-third of all the big game animals of the country. Certainly to some degree because of wise management policies, the numbers of these animals have quadrupled in the past twenty-five years. Yet with one sweep of the Congressional blue pencil this program was destroyed, and at a time when wise management programs of heavily stocked areas were more vital, even, than when the population was sparse. If this is economy then we are Joe Stalin—and we are *not* Joe Stalin.

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FROM the chemical laboratories of our alma mater, Columbia University, comes reassuring indication that the ninety-year struggle to solve the inner secrets of the exact chemical structure of the active principle of poison ivy is nearing a close. This active principle turns out to be a mixture of several compounds having what chemists call the "same skeleton" but differing in structural details. The major remaining problem now is how to get these compounds apart so they can be identified. Professor Charles R. Dawson thinks they have the clue to this. Also a synthetic compound like the active ingredients of poison ivy has been developed, holding promise of desensitizing people sensitive to the poison ivy plant. It turns out, also, that certain fruits, varnishes, lacquers, insulator materials, lumbers, and marking materials affect some people much as does poison ivy, and certain components of these things are sort of cousins to what makes poison ivy poisonous. Thus these studies reach out into the economic world, and the results may aid in reducing, as an example, the industrial hazard connected with handling the liquid derived from cashew nut shell, and used in varnish and insulator material.

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A TWENTY-FIVE percent increase in big game animals between 1943 and 1946 is reported by the Fish and Wildlife Service. Deer compose seven-eighths of the estimated 8,240,400 animals. Rocky Mountain bighorn sheep, moose and elk showed encouraging increases; buffalos, desert bighorns and pronghorn antelopes recorded decreases.

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ALTHOUGH we confess we never did anything about it, we have always felt that Esperanto, the world language, like the world calendar, makes a terrific amount of sense. We have not heard much about Esperanto of late, although thoughts of its value came to mind when we read of the language difficulties of UN and other gatherings of international big-wigs. We are happy to learn that the Esperanto Association of North America is still active, with its secretary, G. Alan Connor, having headquarters at 114 West 16th Street, New York 11, N. Y. He sent us a reprint describing the work of an imaginative geography teacher who, with her class, constructed a relief map of thirty European countries. From each of twenty-six of these she obtained a couple of teaspoonfuls of native soil, which were fixed to the surface of the map. In the process her class learned about national barriers, particularly those of language, yet the correspondence was conducted in one language—Esperanto. This teacher had learned the international auxiliary language, and got in touch with Esperantist members abroad, who responded helpfully, in a manner that a common tongue seems to foster. And, they tell us, Esperanto can be mastered in one-tenth the time needed for the average national tongue. It may now be too late for a common language—and the understanding that goes with it—to help save man from his own destruction, the insensate forces of nationalisms and ideologies being what they are, but let it never be said that we did not have the chance.

R. W. W.

"The flock fed slowly and cautiously toward the spring. . . . One of the older birds was always in alert watchfulness while the others fed."

Revenge in the Meadow

By W. P. HUBBARD

Illustrated by Clarence Tillenius

IT WAS mid-morning of a beautiful June day. I was riding in the high country near the Carson National Forest in northern New Mexico. Suddenly the canyon trail opened into a small mountain meadow. Leaving my horse in the shade of some spruces and aspens, I walked across the meadow to a spring at the base of a low bluff. Fifty feet from the spring, and about twenty feet above it, I stretched out to rest atop a flat boulder that was shaded by overhanging aspens and pinyons.

Between myself and the spring, and directly in front of me, was an open, sandy clearing that absorbed the spring water after it had flowed only a few yards from the bluff. To my right, a jut of timber extended out from the bluff. To my left, a dense stand of pinyons cast their shadows on the clearing, and, in front of the pines, at the edge of the clearing was an old, fallen tree, partly concealed by deep, yellowing grass. Beyond the clearing, the gradual upward sloping meadow stretched out for a hundred yards.

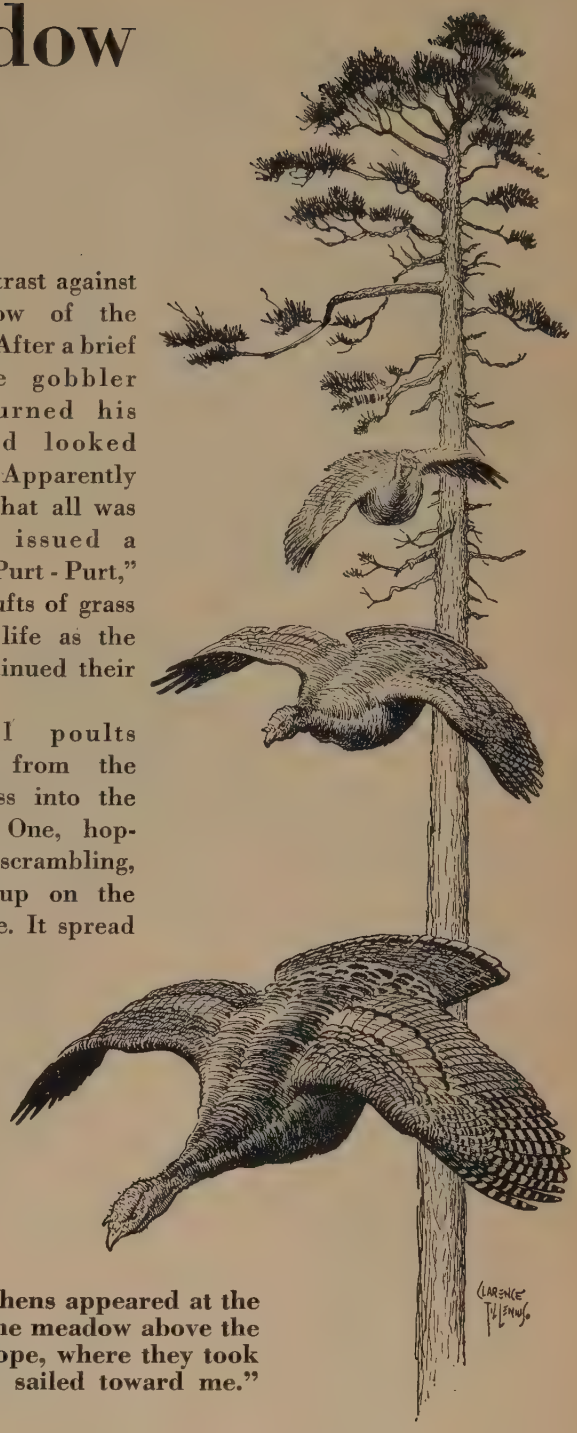
As I gazed over the meadow to the edge of a spruce slope, a sharp "Obble, Obble, Obble" cut the still, thin air. Moments later, a big turkey gobbler, followed by three hens, emerged from the brush across the meadow.

Suddenly, although there was no wind blowing, the tall, thick grass about the four birds came alive with movement, and instantly I realized its swaying was caused by poults. I could not see the youngsters because of the distance, their size, and the blending and coloring, but I knew by the swaying grass that there must be thirty or forty of the little fellows. Soon a poult exposed itself as it jumped high for an insect. Others popped up thus from time to time. The poults seemed to be about six weeks old.

The flock fed slowly and cautiously toward the spring. The gobbler was a giant. Now and then he made a running leap, his wings half opening, as he dashed after a grasshopper. One of the old birds was always alertly watchful while the others fed. When about halfway across the meadow, the troop changed course and drifted toward the mouth of the canyon. I felt sure that if they caught sight of my saddle horse they would take flight. Suddenly the birds turned again toward the spring, but when they reached the jut of timber they all stopped at a commanding "Putt-Putt-Putt" from the gobbler.

Beyond the clearing, the trees, grass and underbrush were bright in the sunlight, and the deep purple heads and the sheen on the bluish, black-brown bodies of the four adult birds stood out in vivid contrast against the yellow of the meadow. After a brief halt, the gobbler slowly turned his head and looked about. Apparently satisfied that all was well, he issued a sharp "Purt-Purt," and the tufts of grass came to life as the flock continued their advance.

Several poults emerged from the deep grass into the clearing. One, hopping and scrambling, climbed up on the fallen tree. It spread its immature wings and ran toward the far end. A foot from the end, without warning, the silent, dirty yellowish-brown form of a timber rattlesnake shot upward from the grass at the edge of the tree and knocked the poult to the ground.



". . . the hens appeared at the edge of the meadow above the spruce slope, where they took wing and sailed toward me."

I shall never forget the startled sensation that went through me at sight of the rattler. My whole body jumped, and how I failed to give my presence away I will never know. Perhaps the turkeys were too excited to notice me.

As the poult fell from the log, it gave a terrified cry. This brought the gobbler, gobbling sharply, bounding to the clearing. The hens, with alarmed "Purts," hesitated until the other poults retreated

from the clearing. Then all but the gobbler hastily moved farther out on the meadow. There a hen isued a series of commanding "Putt-Putt-Putts," and the poults froze, to remain camouflaged in the protecting shelter of the deep grass until the hens returned for them. The hens, in turn, zoomed upward and across the meadow with a roaring of wings, then glided gracefully down over the spruce slope, disappearing from view.

The stricken poult, crying shrilly and pitifully, ran toward the grass, then suddenly staggered, shook violently, and fell forward, dead. The gobbler, still gobbling excitedly, ran toward the dead poult, just as the rattler slithered through the grass at the end of the tree and came into full view on the clearing. The gobbler arched its wings, leaped high in the air, and landed, feathers ruffled in defiance, head straight forward, facing the rattler, which had coiled and was buzzing angrily, about five feet away. The dead poult lay midway between the two.

The gobbler raised one foot and took a cautious step toward the poult; the rattler weaved a little, aiming to strike. When the bird started another step, the rattler struck with lightning-like thrust. At the same time, and just as swiftly, it seemed, the gobbler shot upward, thrashing the air with his great wings, fanning a film of dust from the ground under him. While in the air he threw his legs up and forward, then pulled them back and downward with terrific speed and force in an attempt to drive his up-curved, dagger-like spurs into the rattler. He also hammered viciously with his beak at the snake's head. When the gobbler landed he was beyond another strike by the enemy.

Before the dust cleared, the rattler had moved forward and coiled beside the poult. The old turkey began to circle his adversary with quick, short steps, first toward, then away from it, but all the time edging a little nearer. At every move, the rattler buzzed in warning rage, and kept turning its head and part of its body so as to face the bird.

When the gobbler edged a little closer the rattler struck, missed, and struck again, its fangs and head hitting the turk's beard a glancing blow, and causing it to fly sideways with the impact. At every strike the gobbler's spurs came as close to the rattler as did the rattler's fangs to the turkey.

Part of the reptile's body was now coiled over the poult. When the gobbler began to circle, the snake again turned slowly, its tongue flicking out wickedly. The gobbler took a sudden step toward the snake, which struck back in savage retaliation, only to miss again. The powerful down-sweep of one of the gobbler's wings straightened out the rattler's remaining coil, turning the snake completely over. The gobbler rushed into the thin cloud of dust, and either flipped the poult with his beak, or kicked it into the grass a good six feet away. When the dust settled, the rattler was coiled, weaving its head from side to side, and buzzing in frenzied rage. It struck again and missed.

After the third or fourth strike the rattlesnake seemed to slow down each time it coiled, and its strikes did not seem as swift. And the gobbler kept circling, moving just enough to keep the rattler from getting set for an accurate strike. Suddenly the bird

turned, opened his wings, and stepped toward the snake, which lashed out. The rattler's open mouth shot dangerously close to the fleshy, upper part of the gobbler's legs, and there was a feather sticking from between its jaws as it drew back its head. Before the snake could get fully set, the turkey repeated the movement, and again the rattler struck —to its misfortune, for it was off coil. The strike was wild and wide, and, as it drew back, one of the gobbler's spurs caught the reptile a few inches behind the head and tore a gash in its side. The big bird landed clear, but the snake, stunned and trembling violently, left a thin trail of blood on the ground as it drew slowly back to a half coil, then, reviving, completed its coil.

The gobbler again circled. The snake, infuriated, buzzed continually; its body twitched and quivered. Twice, as the bird circled closer, the rattler lashed out, but both strikes traveled only about a foot and ended with a jerk. Whipping back, the snake struck at the gash in its own body.

Now the gobbler must have sensed his advantage, for he suddenly stopped circling, cupped his wings, and took a step toward the enemy. Then, head low, the turkey stood tense and motionless in a pose of defiance and challenge, alert for the rattlesnake's next move. Momentarily I expected the snake to strike; instead, it slowly raised the fore-part of its body until it was a few inches above the rest of the coil. Then it curved the raised portion into a weak "U" formation and moved its head from side to side, making two or three short, false strikes. As the gobbler moved a leg, the snake cut loose with a furious buzzing. The turk's head was now within easy striking distance of the rattler. The bird raised a foot; the rattler made its last strike. It was a sluggish thrust, and as the turkey went high in the air the snake shot under him. As the rattler drew back, one of the gobbler's curved spurs caught and firmly hooked the rattler at the base of the head; and the spur came through the top of the head. At the impact the snake's body straightened out in a rigid line, and, as the bird hit the ground with a thud, his knife-like beak pounded into the snake's back with the rapidity of a trip-hammer.

The rattler's body quivered a moment or two. Then came terrific commotion as the rattler, its head still hooked on the gobbler's spur, began to thrash about. The turkey gave a startled "Obble-Obble", leaped into the air, and beating his wings kicked in savage confusion in an effort to release the snake. For a few seconds the air was full of wings, flying legs and feet, feathers, a thrashing snake, frenzied buzzing and surprised, frantic gobbling. On the third or fourth trip skyward the gobbler kicked the rattler loose, then rushed at its thrashing form and pounded it with his beak. A few seconds later the rattler again became rigid, this time in a slightly curved position, shuddered weakly and relaxed in death. The old gobbler, issuing sharp, mad, nervous "Putts," backed off and stood eyeing his enemy.

Presently the bird spread his tail in fan formation, dropped his wings, and, as he came into a full strut, burst forth with a throaty "Obble, Obble, Obble" that was a mixture of challenge, victory and defiance. His call resounded across the meadow to the bluff and came echoing back. Then the gallant old bird strutted in all his glory, as he issued that peculiar humming sound of strutting turkeys. He took short quick steps until he came to the rattler. There he proceeded viciously to drive his beak into the snake, after which he kicked it a few times in a contemptuous manner, then turned and strutted to where the dead poult lay in the grass.

He was eyeing the poult when a not-too-far-away, short, inquiring "Obble, Obble," penetrated the stillness. In the excitement of the battle I had forgotten the hens and poults. After

". . . the rattler struck with lightning-like viciousness . . ."

looking warily about, the gobbler gave a deep, reassuring answer. It was not long before the hens appeared at the edge of the meadow above the spruce slope, where they took wing and sailed toward me. Their heavy bodies landed with a thud-thud-thud, as they alighted in the clearing. There was still not a movement from the hidden poults.

Now the gobbler began to strut in an elegant fashion as he moved proudly among his hens. As they looked on he moved over and around the rattler —but the hens did not go near the reptile. They were nervous and excited, and soon left the clearing. A few yards out on the meadow one of the hens gave a deep "Putt-Putt—Putt—Putt." The poults broke from hiding and grouped about the hens, who led them at a brisk pace toward the edge of the meadow. The gobbler, dropping his strut, followed watchfully a short distance behind them. A few minutes later they all disappeared below the brow of the slope on their way to the wooded land below.

Examining the poult, I found that the rattler's fangs had penetrated the body just under the wing. The snake had a gash an inch and one-half long high up on its side, ten inches back from its head. The gobbler's spur had punctured the spinal column as it entered the base of the rattler's head, and had then curved up to come out through the top of its skull. In addition to this, the gobbler had broken the snake's skull in five places with his powerful beak, and punctured the body in eleven places on the back. I skinned out the rattler, later had the skin tanned, and still have the souvenir. It measures four feet, four and one-half inches, and has eight rattles and a button.

The battle had lasted about a half-hour. The rattlesnake put up a gallant fight, but, for sheer nerve and dauntless courage, I think the gobbler deserves greater credit. After kicking or flipping the poult clear, he did not have to join the battle again, but he did, giving me a view of a thrilling wild drama.

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Is There Anything New under the Sun?

ABOUT forty years ago my friend and sometime roommate — Walter L. Hahn — demonstrated that bats in flight were able to avoid wires stretched in a room even when their eyes were covered. Not knowing of the experiments of the scientists, Spallanzani (1794) and Jurine (1798), which had covered the same ground, we thought he was extending the bounds of knowledge. Recently, however, I have read in a book published in 1880 that this ability of bats was known in Pueblo, Mexico, to people who were not at all scientific. Felix L. Oswald, author of *Summerland Sketches*, the book in question, tells of a storekeeper showing him how a pitched bat can fly. His eyes were plastered over with pitch-grease, but, when released inside the store, he "began to navigate the air as steadily and knowingly as any bat . . . in the twilight of a summer day. He avoided the rafters, dodged the hams and fox-skins at the ceiling, and turned just before his wings touched the walls at either end of the building."

The observer-author concluded, "I incline to the theory that the hidden sense . . . of bats is nothing but a very acute sense of feeling, that intimates the neighborhood of a solid obstacle before they come in actual contact with it." Hahn, who, like Jurine in 1798, found their avoidance skill greatly diminished when the ears were stopped, stated: "It is probable that the flying bats perceive objects through the medium of the ears when the air between the moving animal and some solid body is condensed." It is not easy to imagine how there could be sufficient compression of air between a bat's body or wings and a wire to be perceived, and in fact we know that in the dark we can walk into a wall or especially the edge of a door without sensing their presence before colliding.

He and certain predecessors were right, however, about the importance of the ears in the phenomenon. Hartridge in 1920 suggested that bats emit a short wave-length note that is reflected from objects and perceived by the animals in time to avoid collisions. Pierce and Griffin in 1938 reported that bats emit a fairly intense supersonic sound (i.e., above the range of the human ear) and in 1939-40, Griffin and Galambos proved experimentally that the obstacle avoidance of these animals is greatly impaired by closure of their mouths preventing the sound, or of the ears thwarting its reception. To sum up: Flying bats detect obstacles by emitting supersonic notes, hearing these sound waves when reflected back to them, and automatically dodging the barriers.

Without detracting in the least from the luster of these experiments and results, it may be pointed out that avoiding collisions with objects through the use of echoes has been practiced by blind persons for no one knows how long. I have seen such people keeping their distance from a wall by tapping a cane and getting the echoes, and only recently saw one recognizing doorways in a building by difference in the reflections of a low whistle he kept constantly going. He was using the bat's very method, applying merely longer sound waves. Again I wonder is there anything entirely new?—W. L. M.

Adjusting to the Weather

By EDNA HOFFMAN EVANS

A U. S. Army Air Forces Douglas C-47 comes in to land under a zero ceiling, aided by the integrated landing aids system being tested. Included in these aids is FIDO—Fog Intensive, Dispersal Of—, gasoline burners along the runways that dissipate the fog long enough for planes to land or take off.

CAN the weather be controlled?

The question opens up vistas of imagination that rival anything to be found in present-day "pulp" magazine marvels or sci-fantasy romance.

Imagine, for example, the Jones family calling the Central Weather Bureau and scheduling eight hours of sunshine for a day at the beach. Imagine the Riverdale Farmers' Cooperative Association demanding two inches of rain on the week of June 16. Or imagine a Trans-World airplane pilot radioing a request for the removal of a thunderstorm from his flight path.

From these fancies, the imagination can skip to other realms. Suppose one nation should gain control of the areas from which storms originate. Suppose some power-mad dictator of the distant future should decide to "freeze-out" his rivals by an artificially controlled cold wave of long duration. Suppose a superscientific maniac decided to destroy the human race by shutting off the rain supply and turning the entire world into a desert. The imaginary possibilities are endless but, at the present writing, they seem next to impossible.

Weather is too big a proposition to be maneuvered for the benefit of a single individual or family. Its scope is too great for any sort of control under the present world set-up. But perhaps, at some future date, world statesmen will ponder the control of the weather, just as they are now pondering the control of atomic power.

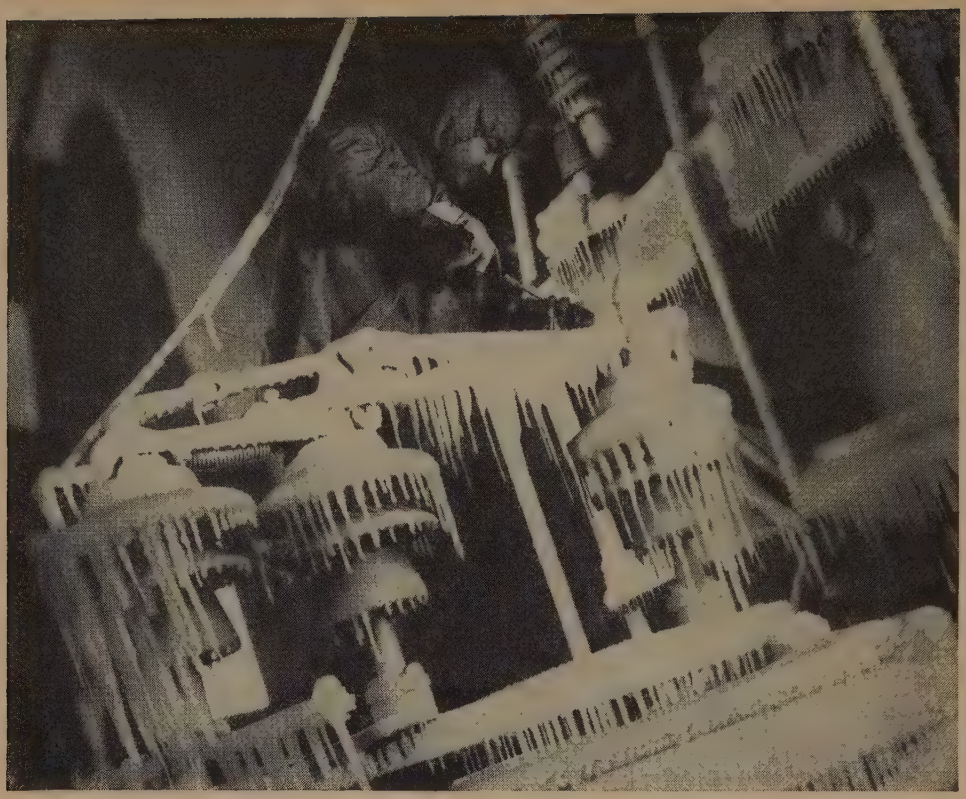
Does man have any control over the weather today? The answer, of course, is an involved one. But, if coming events do cast their shadows before, there are a few shadows to be noted as suggesting the future.

For example, experiments made under the joint auspices of the Army, Navy and Civil Aeronautics Administration have resulted in improvements in fog dispersal devices, originally designed by the British during the war. The system bore the intriguing name of FIDO (Fog Intensive, Dispersal Of). The FIDO system makes use of gasoline burners along runways. These produce enough heat to dissipate the fog long enough so that planes may land or take off. Originally, fuel was burned in troughs along the runway, but more recent improvements in FIDO make use of pumps, which force fuel through pipelines to jets on either side of the runway. The system can be ignited by remote control from the tower.

During a typical test, conducted at the Arcata, California, Landing Aids Experiment Station, the plane came in with a zero ceiling and a visibility of six hundred feet. The FIDO jets were ignited as the test plane flew over the outer marker of the instrument low approach system. The jets flamed for two minutes and three seconds and were then cut off. While lighted, they produced enough heat to burn through six hundred feet of fog so that stars were clearly visible over the end of the runway. The pilot had clear vision for the entire runway as his wheels touched the ground.

So much for fog clearance. Now for artificial rain.

Scientists from the General Electric Laboratory in Schenectady, New York, working with the Army's Air Weather Service, have done much experimenting with artificial control of weather. Their experiments have gone far enough for G.E.'s Irving Langmuir to foresee, within ten years, ability to ward off torrential rains and crippling blizzards from cities. And Vin-



The Arctic transferred to Pittsburgh. Twenty-below temperature is produced in the Westinghouse laboratories to test a power line switch, built for Alaskan use, to make sure that insulation and lubricating oils will function properly in sub-zero weather in northern climates.

cent Schaefer of General Electric believes that, in addition to the ice pellet technique of forcing precipitation, other methods, including using clay particles, offer great possibilities. Schaefer also believes that long-range weather forecasting can be aided by new methods of classifying snowflakes.

Recently a small, speculative stock issue was approved for a concern making a business of bringing about rain or snow. And there looms a question of legal rights to appropriating one State's clouds at the expense of another contiguous State that needs the moisture. Utah is planning legal action against Nevada for cloud piracy. Dr. Harry Wexler of the U. S. Weather Bureau is not as sanguine as the G.E. scientists about controlling weather, but his mind is not closed, however.

The ice pellet system of artificial rainmaking also has been tried in Australia, perhaps more seriously than in the United States. In the land "down under" there are certain rainless areas that could be made fertile and productive. Nature refuses to supply rain, so, reason the Australians, why not rob the rain barrel by scientific methods?

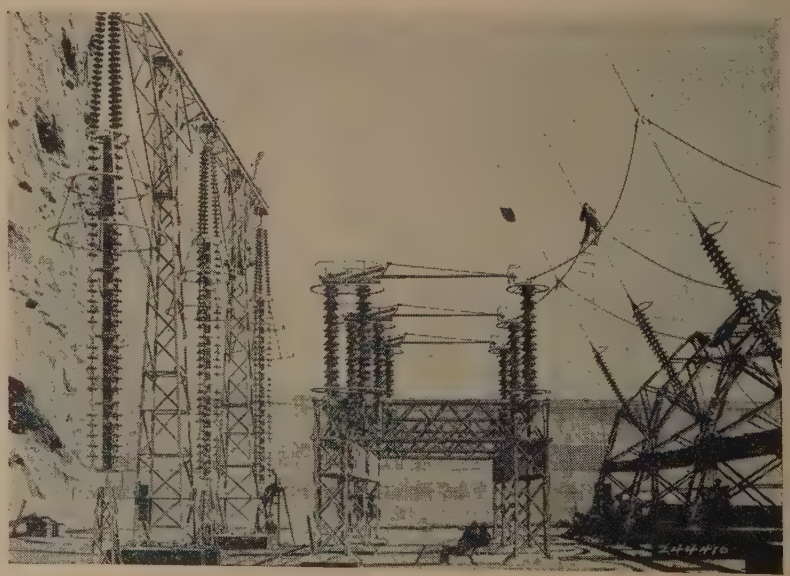
It has been suggested that certain areas in other parts of the world could be set aside as weather controls, heating or cooling them on a vast scale to produce the type of weather desired.

But all these weather controls, like rocket trips to the moon, are possibilities for the more or less distant future. True, rockets may be taking off within a few years, but no travel agency as yet can offer round-trip lunar excursion tickets. Neither are scientists scheduling showers or fair weather for any given day in 1997.

As things stand today, man must accept the weather as Nature presents it—an endless procession of barometric highs and lows or cyclones and anticyclones, of cold, occluded or warm fronts, of sunny days and stormy ones. Since he cannot change these to any marked degree, he must modify his own works to withstand the weather's onslaughts.

By gigantic projects, like the TVA, man has learned to control floods and to store up water reserves against dry spells. By means of contour plowing and scientific land management, he has learned to check erosion.

Elaborate warning systems have been developed to watch for hurricanes, for cold waves, and for



On the power-house roof of Boulder Dam are lightning arresters, disconnecting switches, and the take-off structure for the high-voltage lines that rise almost vertically to the towers above. This is a Westinghouse installation.

It is to guard power lines like these from lightning and other onslaughts of weather that scientific research is done. Thus, since man cannot control the weather, he can at least adjust his works to it. This giant framework, standing in the desert, is one section of the 287,000-volt transmission line running from Boulder Dam to Los Angeles.

weather that favors the starting of forest fires. Special services tell truck farmers and grove owners when to protect their crops against frost, and let flower growers know when it is unsafe to ship their blossoms.

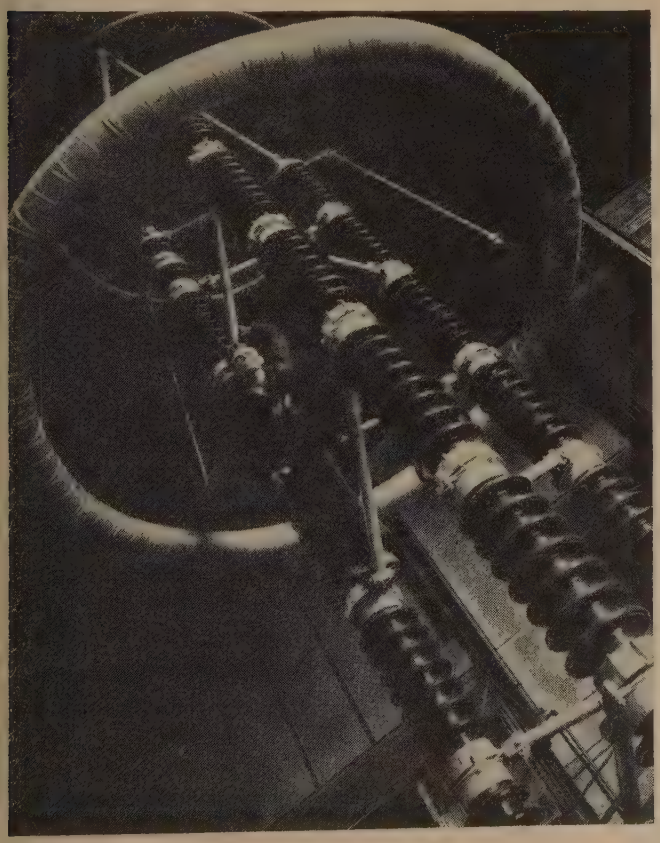
Weathermen prepare storm forecasts for the Great Lakes, serving ships that carry cargoes valued at two billion dollars a year. Weather reports help keep the railroads rolling, bringing trains through in spite of heavy rain, snow, sub-zero cold, floods and blizzards. They help also in protecting goods from damage, foodstuffs from spoilage, and livestock from injury or death from weather extremes in transit.

Observers for pilots scan the airways and maintain for them a special Flight Advisory Weather Service (FAWS). This is available to both commercial and private fliers, and figures show that between 1936 and 1946 the percentage of private aircraft accidents attributable to weather was reduced from eight per cent to three and six-tenths per cent. A special service is maintained for pilots flying Alaskan air routes, where hops are longer and hazards more frequent.

For public utilities such as light, power, gas, telephone and telegraph, daily weather reports perform additional services. If a cold wave is in store, gas and power companies can prepare in advance for extra load requirements. Supplies can be checked. Additional service crews and repairmen can be mobilized, ready to replace telephone, telegraph or power lines torn down by high winds, washed away by floods, or crushed by loads of winter ice.

Radio, it seems, can go its way, sending out its concerts and comedians, newscasts and sporting events, soap operas and serials, with a minimum of weather interference. Of course static, the audible result of various atmospheric disturbances, is sometimes annoying to the individual listener. Fading, too, is a problem. But weather is only one of many factors involved in radio reception. Thus, for the present at least, little can be done, so far as forecasting for favorable radio reception is concerned.

To keep track of the weather, and to help people adjust their lives and activities to its changes, the United States Weather Bureau maintains 412 offices staffed by full-time employees. Of the total, 340 offices operate twenty-four hours a day, seven days a week. In addition to these, (Continued on page 270)



This is the world's largest lightning tamer. It is 40 feet tall and capable of taming the most powerful thunderbolt. This experimental model, built by Westinghouse, with two others of different design, will help give engineering information on the best type of protection for transmission lines. This "sentinel" will conduct harmlessly to the ground heavy power surges that travel along the wires after a lightning hit, thereby assuring uninterrupted service to factories and homes.

Birds Against Beetles

By HERVEY BRACKBILL

Illustrated by Romeo Mansueti

SOMETIME during June there will begin appearing in the eastern States a new generation of one of the most destructive insects this region has ever known—the Japanese beetle. And as the hordes swarm over flower and vegetable gardens, shade trees, truck patches and orchards, devouring blossoms and foliage and fruit, harassed growers will again be asking: "Do we get no help from the birds against these pests? Do no birds eat them?"

Indeed, birds *do* eat them. No fewer than twenty-one species are now known to feed upon the big, plump beetles. Not all of the twenty-one feed on them heavily. Some appear to capture them only occasionally, as chance may dictate during general foraging. But a number of other birds—including some of our most abundant and familiar species—plainly find the beetles definitely desirable, and hunt them down deliberately and devour them in large numbers.

The hunting is done everywhere from below-ground to the tops of trees. Besides capturing mature beetles, some birds dig up their grubs, which themselves do great damage by eating the roots of grass. One species has been seen to make catches on the crown of a fifty-foot tree. Still others feed at all the levels of foliage between those extremes, and in addition some pursue flying beetles and catch them in the air.

Topping the list of destroyers, to judge from studies by government investigators, and several years of personal observation in bad beetle areas, are the purple grackle, English sparrow and starling. Close behind these come the meadowlark, cardinal, catbird, wood thrush and red-headed woodpecker, and then, forming a group of fairly heavy feeders, the robin, red-wing and brown thrasher.

Rounding out the present roster, with the status of destroyers more casual in their hunting or more limited in their numbers, are the kingbird, crested flycatcher, bob-white, vesper sparrow, crow, blue jay, song sparrow, mockingbird, scarlet tanager and cowbird. In addition to these wild species, barnyard fowl and the introduced ring-necked pheasant eat the beetles.

Some years ago, when government men collected a considerable number of various birds in beetle-infested areas, to see by stomach investigations which were eating the pest and in what quantity, they pronounced the purple grackle our greatest ally. Every one of twenty-nine grackles they examined had eaten Japanese beetles, some to the exclusion of all other foods, and all to such an extent that when the food of the twenty-nine was lumped together the beetles comprised sixty-six percent of it.

In that study the English sparrow and starling both fell lower in percentages; beetles comprised only "a trace" of the total content of seven sparrow stomachs, and only forty-two percent of the food that twenty-three starlings had eaten. However, the abundance of these two species everywhere seems to the field observer far to offset that difference in percentage, and in and about our cities, at least, the sparrow must be the greatest beetle destroyer of them all.

The English sparrow is also the most versatile of the birds in its hunting. It sometimes gives chase to low-flying beetles and seizes them on the wing. It searches them out on climbing vines, and at least as high as eighteen feet up in trees. It flies to commanding perches on infested shrubbery and, on rose bushes and trellises, scans the leaves and flowers. Upon locating a beetle, the bird swoops down upon it. It searches such bushes from below, hopping along the

In June the advancing army of Japanese beetles is met by an equally determined army of birds. Officers in this defending force are purple grackles, English sparrows and starlings. Competent noncoms include meadowlarks, cardinals, catbirds, wood thrushes, red-headed woodpeckers, robins, redwings and brown thrashers. In the ranks are other fine soldiers.

flower beds, peering intently, and then darting upward to seize its prey.

The sparrow can, incidentally, be deliberately put to work in this way, as a little experiment one summer demonstrated. While I had a feeding place for birds close beside a rose bed in my yard, I noticed that every now and then the sparrows that came there for bread would also search the roses for beetles, even though plenty of bread was available. When, however, I one day changed to a feeding spot some distance away, the beetle-catching almost ceased. The next day I strewed my bread down the rose bed itself; at once the sparrows resumed their hunting at the original rate.

Apparently finding the beetles' big soft bodies ideal morsels for their nestlings, the sparrows are particularly effective destroyers when they have families to feed. At these times they may carry the insects to the nest two at a billful; or, if the nestlings are very young, the parents upon capturing a beetle will take it to the ground and there tear off the head, the hard coverings of the thorax and wings, and perhaps the legs, and carry the soft abdomen alone to the nest.

Not only the English sparrow, but a number of other birds use the hunting method of moving along beneath bushes or weeds, peering, and then darting up to snatch off beetles. The grackle, starling, robin, wood thrush, bob-white and brown thrasher, at least, catch the adult insects in this way—all but the last-named of these species, and, in addition, the crow, also dig up the white grubs that are the larval beetles.

The grackle and starling feed at higher levels, too, however, sometimes together and particularly in orchards, where they climb about actively in the trees. One grackle that I singled out for watching in a heavily infested plum tree caught a dozen and a half beetles in just a few minutes. And although it and its companions sometimes hopped from twig to twig so heavily that they defeated their own purpose by jarring the insects off to the ground in a shower, one of the government investigators noted an instance in which accompanying starlings seemed to benefit by similar mishaps.

"I saw a flock of these two species feeding together," C. W. Leister reported, "the grackles keeping to the trees and the starlings to the ground. The beetles on being disturbed by the grackles fell to the ground instead of taking flight. . . . Owing to this fact, the ground-feeding starlings probably found them easier to get than did the grackles."

The brown thrasher has been stated to act in this way for its own benefit—to fly at blooms on which beetles were clustered and so knock them to the ground, then seize them there.

Various levels of foliage are covered by other beetle-eating birds, in various ways. The cowbird appears to be one of the casual feeders, merely taking fallen beetles it encounters in foraging over the ground. The cardinal commonly hunts in high vines and the lower trees. On all of several occasions that the bluejay has been seen at work it has been at about the twenty-foot level—and always gobbling down a couple of beetles in quick succession. The scarlet tanager and mockingbird, besides picking the insects off low shrubbery, do some hunting as much as twenty or twenty-five feet up in trees.

The highest feeders of all are the red-headed woodpecker and kingbird, with the kingbird taking the very top honors; I have seen this bird assume a post in the top of a beetle-ridden, fifty-foot elm, and from there repeatedly fly out and pluck the insects off the upper twigs.

The red-headed woodpecker feeds to almost as great a height—from twenty feet up to at least forty—and feeds voraciously. Bird students before now have thought that this species showed an especial liking for brightly colored insects, and their idea gains support from the avidity with which it hunts down the Japanese beetle, a gleaming thing of coppery brown and metallic green.

This bird is another that finds the beetles excellent food for its young, and when these young begin to feed themselves they join in the hunting. Most often, from some heavy stem or branch of a tree the woodpecker singles out a beetle on a peripheral twig or leaf, and flies to it and captures it from the wing. Sometimes the birds hitch their way out on a branch to the twig, but at these times they, like the grackles, are apt to move too heavily and cheat themselves of their intended quarry by knocking it to the ground.

Once caught, the beetle may be gulped directly, beaten on the perch a few times first, or stuffed into a crevice and cracked like a nut. Whichever the method, the bird is soon ready to go after the next one, and I have seen catches made as high as twelve in ten minutes. If it were as abundant itself as some of our other birds, the red-headed woodpecker would certainly be one of our very greatest avian allies.

Big Bill— The Pelican

By BLAIR CHAMBERLIN

There is something calm and majestic about the flight of the pelicans. On the wing they lose the seeming awkwardness that they show on land.

★

ALMOST like a weird creature from another planet, or a left-over from prehistoric time, the pelican would seem to be more at home in a world inhabited by dinosaurs and pterodactyls than the one we now know. In fact, from evidence uncovered in recent years, it is believed that the pelican did exist in North America as long ago as the tertiary period; that it is one of the few vertebrates to come down to us, from the past, in physical features practically unchanged from its ancestors.

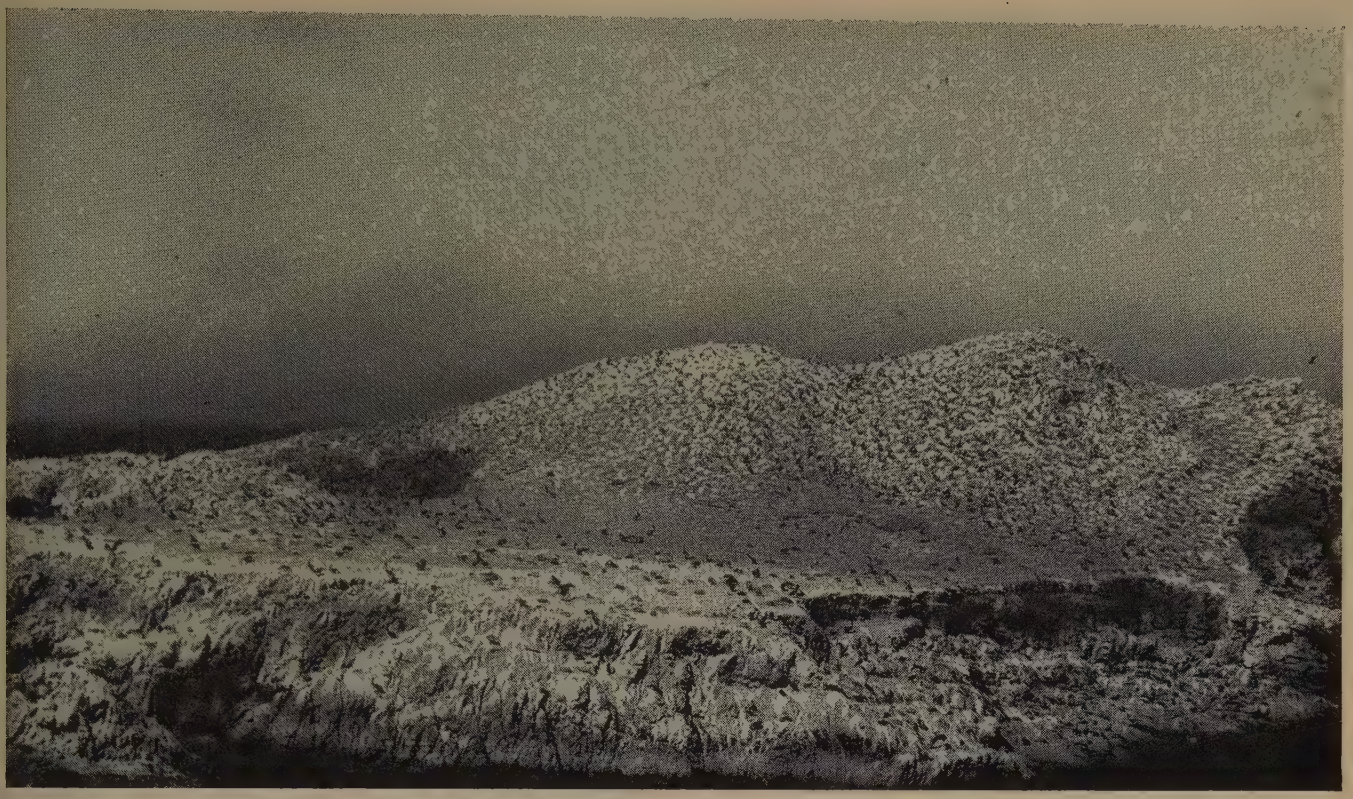
One of the most meek-mannered of birds, the pelican is a feathered paradox — pathetic, yet ludicrous; apparently clumsy, but still a creature of astonishing skill and dexterity. He is majestic in flight yet awkward ashore. His prowess as a fisherman is unexcelled, and when a brown pelican goes into a power dive, plunging like a projectile into the sea for his fish dinner, he seldom fails to come up with a loaded pouch.

Like so many of our birds and other wildlife, the pelican has been made to suffer at the hands of man ever since his first contact with civilization. In the days when it was fashionable to adorn women's hats with stuffed birds, white pelicans were killed for their plumage and their quills. Big Bill's grotesque appearance and great size make him more conspicuous than most birds, and hence a ready target for sadistic individuals who seem to revel in wholesale slaughter of his kind.

PHOTOGRAPH BY LEWIS WAYNE WALKER

A brown pelican "puts on the brakes" as it comes in to land near its nesting site.

The fact that pelicans live almost exclusively on fish has given them a bad reputation, and has led to the destruction of entire colonies. They, like other fish-eating birds, have been ruthlessly persecuted in many instances because of the mistaken idea that they subsist almost entirely on commercially valuable or game fish. Studies tend to prove that the birds eat only a small percentage of game fish; often eat fish that are harmful to the valuable species. Most objections to the pelican as a fisherman have apparently been based on the quantity rather than the kinds of fish consumed. This is understandable when it is realized that an adult pelican may eat an average of four pounds of fish per day, and, in a year's time, a flock of 10,000 birds could consume in the neigh-



Pelican Island near Monterey, California. At times this barren islet is completely covered with pelicans, seagulls, cormorants and with sea lions.

borhood of 8,000,000 pounds of fishes. This is a lot of fish in any man's language, but if these fishes are commercially valueless, and the waters from whence they are taken do not show signs of depletion, the situation is not as serious as it at first might seem.

The pelican family numbers some eight species; two found in North America. The Eastern brown and the California brown pelicans are quite similar in size and appearance. A compactly built bird, the brown pelican often weighs as much as twelve pounds, and has a red pouch, white head, dark brown neck and brown and grayish body. It is found along both our southeastern and southwestern coasts and the Gulf of Mexico.

The white or rough-billed pelican has white plumage tinged with black or gray, a reddish bill and pouch, legs and feet of bright orange-red. With a wing spread of eight to ten feet, the white pelican is a veritable giant of the skies and one of the largest of all North American birds. Formerly the white pelican was an infrequent straggler on the Atlantic Coast. Along some of the Mississippi Valley waterways it was an occasional visitor but did not breed. Because of the encroachment of civilization it is now found on only a few of the more remote lakes and marshes of our western states and southern Canada. Even here it has been able to survive in only a few of its former great colonies.

To observe the calm, majestic flight of these ponderous birds, or to see them assembled in snowy ranks along the shoreline of some wilderness lake, gives one a picture not soon forgotten. The birds' great size and strange appearance seem to make them more or less symbolic of the wilderness. Their deliberate, solemn and unhurried manner gives one the impression that they have always been, and should forever remain, a changeless part of Nature, ageless and eternal.

While the white pelican has a tendency to keep man at a distance and seems to prefer the solitude of the unspoiled wilderness, his cousin, the brown pelican, is more tolerant of man. Perhaps his haunts have been invaded by man so long that he has decided to make the best of it. Proof of his willingness to mix can be seen in almost any seacoast town or fishing village, where often some of the pelican populace may assume the status of "local characters."

Several years ago a temporary fish shortage in the waters about Monterey, California, caused a near famine among the local pelican colony, until one old patriarch took to ambling along fishermen's wharf in search of something to eat. As few folks can resist the mute appeal of a hungry pelican, old Panhandling Pete soon had a pouchful of fish. Shortly he disappeared, but came hurrying back with a group of his famished friends trailing behind him. They, too, soon caught on to the sly technique of their panhandling pal and took to hanging around the back doors of the fish houses waiting for handouts. It was impossible to ignore their doleful pleas, and the friendly fishermen soon provided them with a daily ration of scraps, saving the birds from starving.

At recess one day the students at a grade school about a mile from the ocean were startled to see an odd, shaggy-looking figure plodding up the dusty road that led toward their school. It was a pelican, apparently intent on visiting school. As he entered the playground and joined the throng of excited youngsters, he stopped and gazed around with a quizzical look as though to say, "Well, kids, here I am; what do I do now?"

Pelicans apparently have their own mutual aid society, too. They have been known to aid an injured comrade that was unable to fly, and to keep him from starving, with fish they caught and brought back in their pouches. Early settlers on the California coast have told how, sometimes, Indians took advantage of this pelican peculiarity and would wound a pelican, tie it to a stake, and, concealing themselves, lie in wait until other pelicans came to the rescue with a pouchful of fish, which the Indian would then appropriate for himself.

The pelican's trademark is his big bill and gular pouch, and an adult brown pelican often sports a bill more than a foot in length. The pouch is used as a dip net to catch fish, and is capable of holding as much as three and a half gallons of water.

Unlike the white pelicans, which often gather in small groups for their fishing, the brown pelicans do their fishing on their own. Once the fishing grounds are located it is a case of every bird for himself. When a school of fish is sighted a brown pelican, gliding along swiftly from thirty to sixty feet above the water, can put on the brakes and check his flashing speed with amazing abruptness, then hurtle downward like a dive bomber at the target. The bird strikes the water hard, scattering spray high and wide, and disappears momentarily beneath the surface, to bob up soon with his pouch filled with water and wriggling fish. He tilts his big bill upward at an angle, contracts the pouch to expel the water and then "down the hatch" goes his fish dinner.

The force with which a pelican strikes the water would at least stun an ordinary bird, but, to enable it to withstand these repeated shocks, Nature has provided a pneumatic cushion just beneath the outer layer of skin. These air-sacs also give the pelican greater buoyancy in flight, and are in part responsible for his ability to glide for such long distances without flapping his wings.

White pelicans do not dive for their food but fish from the surface of the water. Groups of these birds sometimes form a semicircle off shore, and, with a great beating and flapping of wings, churn the water to drive the frightened fish shoreward into the shallows where they can be more easily scooped up.

A pelican coming in for a landing is awkwardness personified. As he plummets earthward with feet outstretched, wings threshing wildly and bill withdrawn, he looks as though he were prepared for the very worst. When he at last finds himself safely aground

PHOTOGRAPH BY THE AUTHOR

It is difficult to believe that these droll-looking creatures are real California brown pelicans and not some strange creatures seen in an animated cartoon.

with no bones broken and all in one piece, he appears just as astonished as the onlooker. As he stows his huge wings and relaxes his taut muscles, he seems to heave a sigh of relief as though to say, "Whew, I'm glad *that's* over!"

Ashore, the pelican often perches precariously on a jagged rock just out of reach of the thundering surf and there relaxes in solid comfort, his long neck and bill in a jack-knife fold, or his head twisted in an acrobatic half-turn and his beak resting along his back. When the bird unfolds from such a posture he looks like an animated folding rule performing a contortionist act.

In flight, the pelican is really in his element. The effortless ease and skill that he displays as he glides with unbelievable accuracy, scant inches above the angry, storm-whipped waters, often following the very contour of the waves, is nothing short of amazing in a bird that otherwise seems so clumsy and awkward. What could be a more fitting symbol of the strangeness and mystery of the sea than a long line of brown pelicans, etched in silhouette against the darkening sky of evening, winging their calm and majestic way homeward at the end of day?

The weirdness, the pathos and grotesqueness that go to make up the peculiar pelican reach a climax in a colony at nesting time. (Continued on page 276)

The mother polar bear is solicitous of the welfare of her cub, which is at the tender age of one hundred and seven days.

Wild Animal Parenthood

By KEN STOTT, JR.

Photographs by G. E. Kirkpatrick

THE Old Woman Who Lived in a Shoe may well have had her problems, but her existence was one of bliss and tranquillity compared with that of a fur seal bull. Her difficulties would have been mere trifles to the lord and master of a half hundred bickering wives, and of as many petulant puppies. All through the long summer he must remain constantly on the alert for bachelors who are not above stealing another's wife, or wives. A moment of inattention might well see his harem and nursery devastated by such poachers. Consequently he watches over his flock day and night, rarely eating or sleeping. For sustenance during the first two months at the Pribilof rookeries, he depends almost entirely upon the reserve of fat he has accumulated through the months of the preceding winter at sea. By summer's end his rolls of fat have disappeared and his exhausted body is lean and undernourished.

Contrasting the sacrificial vigilance with which the fur seal guards his harem is the case of the indifferent brush-turkey hen. Once this giddy Australian fowl has buried her eggs in a pile of decaying vegetation, she promptly forgets them. It is simply a matter of "out of sight, out of mind." The eggs are incubated by heat generated in the decomposition of the heap of rubble, and the chicks, upon hatching, push their way unaided from the debris, to begin life orphaned and alone.

Such contrasting examples represent the extremes in family government in mammals and birds, and between the two lie as many degrees of parental responsibility as there are species. Some creatures regard their young in what seems to be a most casual light, attending them for only a few weeks after birth or hatching, or not at all, while others devote years to the duties of bringing up their offspring with infinite tenderness and patience.

Such opposite attitudes, regardless of what they may seem, are far from individual whims. Parents of each species do only those tasks that Nature herself has left undone. Upon entering life, an animal such as a brush-turkey is well enough equipped, both physically and mentally, to meet the conditions into which it is thrust. A fur seal baby, on the other hand, is a helpless little creature that must be protected until it is in full command of its faculties. Its senses must become as acute as those of its parents, and it must learn fully the uses and control of

its muscles before it is fitted to capture its food, and to undertake the arduous winter migration.

It seems strange that of all infants none is more completely helpless at birth than the progeny of the mighty grizzly. Born in the dead of winter, a grizzly cub is a tiny wisp of wrinkled flesh. Its eyes are tightly closed and its limbs are weak and useless. No being could be more utterly at the mercy of its environment. Fortunately, Providence has seen to it that the grizzly cub's infantile environment is a kind one. Birth comes early in the mother's annual period of hibernation. During the ensuing months, spent deep in the den, the cub's frail body is given ample opportunity to develop and grow strong on the richness of its mother's milk. Its teary, shoe-button eyes pop open, first one, then the other, and its voice, a thin wailing mew at birth, becomes loud and lusty. At first the youngster crawls about, flat on its fat little stomach, but, as it gains in strength, it attempts its first steps on wobbly and unpredictable legs. The cub learns to sense its mother's moods and to understand and follow her directions. When, at last, the great day comes for the cub to accompany its mother into a strange world full of unseen dangers, it must have learned to obey her commands implicitly.

Mother chimpanzee and six-month-old baby. The baby chimp, at birth, is totally dependent upon its mother. It is pink-skinned with a knobby head that is wizened and wrinkled.

The cub's first year is a busy one and full of new and wonderful experiences. Although it nurses until it is six months old, the youngster begins early to acquire a taste for solid foods. Under its mother's supervision it samples succulent berries. She shows her offspring how and where to dig for bitter, spicy tubers and introduces it to the tangy sweetness of wild honey. The mother teaches, through play, the art of self-defense, and, in more serious hours, she acquaints the cub with its enemies. The lessons of that first year are of vital importance, and the cub learns them well, for in its second year it must meet the problems of life alone.

Like the grizzly cub, a chimpanzee baby at birth is totally dependent upon its mother. Its pink-skinned body is almost hairless and its knobby head is wizened and wrinkled. The baby's limbs are slender and wiry and at first serve only as clamps with which to fasten to the mother's rounded abdomen. The young chimp knots its hands and feet so tightly about tufts of the mother's coarse fur that the infant can hang upside down like a sloth as the parent walks about on all fours.

The ape infant seems perfectly content with the position, and, if it had any say in the matter, might well remain there for the rest of its life. But when the young chimpanzee has reached the age of eight or nine months, its mother becomes weary of her burden and decides the time has come to prepare her offspring for a life of its own. Gently she disentangles the tiny fists from her fur and wraps them firmly about a twig. Then she grasps the youngster about its middle and moves it away from her body. Frightened and bewildered, the baby pulls its hands away from the branch and whimpers soft reproaches. Oblivious to this complaint, the mother places the babe's hands once more on the twig and holds it from her. The process is patiently repeated and it is not long before the young chimp becomes accustomed to hanging by itself and begins to enjoy relative independence. Gradually the youngster learns to hang without mama's support, and soon takes pleasure in climbing hand over hand up and down the branch.

The next step in chimpanzee education occurs when the youngster first is allowed to sit upon the ground. Its mother's bowed legs, flat against the earth, form a walled compound and within its security the offspring sits contentedly, or stands on all four feet in imitation of its elders. With full confidence gained in untried legs, the mother takes a pink-fingered hand in her long black one and, as she slowly leads, the young chimp stumbles along in an awkward, three-legged gait. Next mama places the youngster's hand on the back of her thigh and, with this added support, it follows her as she walks through the forest. The chimp soon realizes that it is far easier to walk on all fours, even without the aid

of the mother, than it is to walk on three legs and cling to her with the fourth. From that hour on, the patient mother, who has so recently encouraged her baby along the path of independence, must now spend every waking minute in a futile effort to keep the young scamp out of mischief. A born tease, it derives a diabolic pleasure from making life miserable for anyone nearby. It frightens its father by landing unannounced on the broad belly of the sleeping old man, and plagues an older sister until she throws herself into a tantrum of frenzied screaming. If, eventually, annoying pranks arouse unveiled hostility and the youngster senses imminent danger, it is off like a flash, screaming at the tops of its lungs until it reaches the ever-waiting and ever-protecting arms of its mother.

The chimpanzee baby remains with the family until, at length, its father sees in his son a future competitor. When this revelation occurs, he is driven from the family group to establish a household of his own.

The young of many species of birds are, like the chimpanzee, exceedingly slow in development, and remain members of the family group for considerable lengths of time. Parrots, pelicans, swifts, cormorants, kingfishers, hornbills, and crows are a few of the types of birds that emerge from the egg in a helpless and nearly or completely featherless condition. A newly hatched parakeet, for example, resembles a half-grown embryo. Its fragile, waxen body is colorless except for a bluish network of blood vessels, and its eyes assume a deathly gray beneath their unopened lids.

Twice during the past four years, San Diego Zoo workers have been privileged to observe what is perhaps the most miraculous of avian transformations, that in which a shapeless lump of down-covered flesh assumes the characteristics and dimensions that typify the adult South American condor. It was in the spring of 1942 that the condor hen deposited her first cream-colored egg in a crevice in the cliff at the upper end of the bird-of-prey flight cage. There the precious egg was incubated, first by one parent, then by the other, and always with solicitude.

The young giraffe is two days old, a perfect miniature of its towering mother. Newborn giraffes seem utterly fearless and pay little attention to the fears of their mothers.

Finally, after fifty-six days and nights, there emerged a ludicrous little being that in no way resembled its splendid parents. Its body was dumpy and clothed in leaden-gray down, but even upon hatching the chick bore a rudimentary comb on its forehead, undeniable evidence that the bird was a male. For four months he remained in the nest, and the parents continually carried food to him in a vain attempt to satisfy his constantly growing appetite. By the time he was ready to leave his nest, his body color had changed to chocolate-brown. The wings now bore flight feathers, but the remainder of his body was still covered with down. At eight months the condor chick flew for the first time, and downy plumage remained only on the neck and thighs. At the age of two and a half years, he was sent to the National Zoo, and, although he was now fully as large as his father, he was yet clad in the dull, drab brown plumage of immaturity.

A giraffe calf might look with scorn upon such pampered and helpless creatures as the condor chick and the chimpanzee infant. Almost within the hour of its birth, a young giraffe is on its feet and displays a remarkable—if incomplete—degree of coordination. It is in every way a perfect miniature of its towering mother. Its bristling mane is trim and well developed and two black tassels on its crown offer mute evidence of the budding horns that will grow out later.

The baby giraffe's first paces are self-conscious and unsteady, but within a few days it has adequately mastered the art of walking. Running is a different matter and one in which initial attempts usually terminate in failure. It is easy enough to begin, but, once under way, long-legged baby finds itself unable to stop. On and on it runs, leaning farther forward every step until at length it tumbles awkwardly to the ground with its knobby legs sprawled in every direction. Persistent and undaunted, it rises for another try, and practices faithfully until eventually it becomes adept at the graceful running stride.

Newborn giraffes seem utterly fearless and pay little heed to the fears (Continued on page 270)

Battlewise Birds

By JACKSON M. ABBOTT

Illustrated by the Author

". . . a large, brown, tawny owl, closely resembling our barred owl, burst from the vines and floated off down the path, with the two blackbirds, which are really black thrushes, in close and decidedly vociferous pursuit."

THE hedgerow was ominously silent as we crept along the narrow dirt trail made centuries ago by Norman farmers. The path had long since become overgrown on either side and roofed over with high-reaching gorse bushes and vine-covered trees. It was like walking down the aisle of an empty, silent church, but here the aisle was strewn with the broken, awkward bodies of German soldiers, and, occasionally, the lifeless form of an American. Now and then the sound of sporadic rifle and machine-gun fire drifted to us from a large apple orchard about 600 yards to our right front. Suddenly the sharp, tearing "br-r-r-r-t" of a Schmeizer pistol shattered the near stillness, only two hedgerows away, indicating the presence of a German overlooked by our advancing infantry. This outburst of noise was immediately followed by the deep-voiced, staccatic rattle of an American automatic rifle, punctuated by several rapid shots from a carbine. The ensuing silence told the story of that German soldier's fate as clearly as if we had seen the action.

As the two sergeants and myself cautiously proceeded along the trail, two blackbirds started an angry commotion in a thick tangle of vines choking one of the taller trees by the path. As we approached the tree, a large, brown, tawny owl, closely resembling our barred owl, burst from the vines and floated off down the path, with the two blackbirds, which are really black thrushes, in close and decidedly vociferous pursuit. For a moment my mission, which was to locate a reported German minefield in a nearby orchard, was forgotten as I focused my attention on the brief and bloodless avian dogfight. The birds disappeared around a bend in the path and silence once again descended along the hedgerow.

In many similar situations, when death for humans seemingly lurked in every shadow, I have been amazed at the number and variety of birds in the vicinity. True, they were much quieter and less conspicuous than usual, but many seemed able to accustom themselves to the continual battle noises, and, in some cases, even when on the receiving end of artillery fire.

I remember well one occasion on which exploding shells acted merely as an annoyance to a flock of hungry pigeons. It was the day after the German city of Cologne fell to the 104th Infantry division. My team was deactivating some Riegel mines, the Germans' deadliest and most sensitive antitank mines. We were working by a building about a block to the rear of the famed and comparatively unscathed Cologne cathedral, between the cathedral and the Rhine River. The far bank of the river was held by the Germans, and we were not only under direct observation each time we stepped out from the shelter of the building, but were also subjected to intermittent artillery and mortar fire. This fact made mine deactivating all the more hazardous because a flinch at the wrong moment when engaged in such an operation might easily be one's last involutary action before leaving this earth.

The pigeons were feeding in the rubble-strewn street about half-a-block away. I soon noticed that, a few seconds before the whistle of an oncoming shell became audible to our ears, the pigeons flapped noisily into the air and flew over to the cathedral, which both the Germans' and our artillery carefully avoided hitting. After the shell had exploded in the area the pigeons returned and resumed scavenging in the rubble. Thus, the birds served as an alarm for us, their acute hearing detecting the whistle of each approaching shell several seconds before we could, and their rapid retreat to the cathedral warned us to duck safely before the shell crashed in. A pair of kestrels, which are similar to our American sparrow hawks, also used the cathedral as a refuge. They circled in the air, catching insects within a radius of 200 yards of the cathedral, and flew in close to the tall spire each time a shell approached.

Not all birds are so indifferent to warfare. In some instances where a particular habitat is the scene of a battle a bird will temporarily forsake its ancestral locale for completely abnormal surroundings. Before the Saint Lo breakthrough in Normandy the Americans had tried for several weeks to drive the Germans from the southern end of the Carentan swamp, near Isigny. The swamp had absorbed a large quantity of both German (Continued on page 272)

Kent Island, Avian Paradise

By W. BRYANT TYRRELL

Photographs by the Author

South Point of Kent Island at high tide and on a rough day. Below, the headstone that marks the grave of John Kent, first settler and owner of the island, and of his wife, Susanna.

IN the mouth of the tide-famed Bay of Fundy lies Kent Island, one of the rocky members of the Grand Manan archipelago. If you prefer the hurly-burly of the city, this is no place for you. But if you would delight in the cries of myriad gulls, in the incessant beat of waves upon a rocky shore; if you would find music in the hoarse call of the foghorn, or companionship with legions of birds, then you would find this isle a paradise.

On this sea-girt spot live some fifty thousand birds. At least thirty species nest on this mile-and-one-half long by quarter-mile-wide island. One hundred and eight species, according to the record, visit there. This avian population provides the destiny the island now fulfills—a spot for much serious scientific study of birds.

Myth mingles with mystery to enshroud the history of Kent Island. In the early 1800s John Kent and his brother came to the island from England, prospering by piloting ships up the Bay of Fundy, and intensively farming the half-mile of open meadow. In 1819 the Province of New Brunswick gave the Kents a grant to the island, and they sent to England for their families. An imposing homestead was reared, later to burn, save for one wing, which now serves as a home for the resident warden. In the days of the Kents the southern end of the island was connected with a mass of rocks on the east, known as the Eastern Ledge. Thus a safe, deep-water harbor was formed, and there the owners moored their boats. Today the land connection is no more, and moorings are offshore.

A headstone marks the grave of John Kent, who died in 1828 at the age of 67. There is no clue to the fate of his brother, but John's wife, Susanna, lived to be 92, dying twenty-five years after her husband, and, in that quarter century giving rise to such stories of witchcraft that she and the island were both avoided.

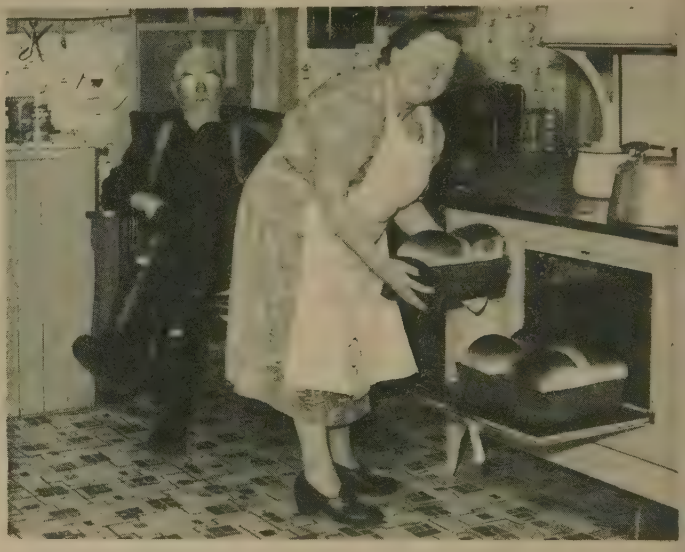
Through the years the island was farmed, and supported considerable numbers of birds. Among these were American eider ducks, whose eggs were considered a delicacy, and whose down was so prized that both were gathered in such quantities as to threaten the extirpation of the birds everywhere. Kent Island's eiders were no exception, and, in 1930, Allen Moses, a Grand Manan bird enthusiast, influenced J. Sterling Rockefeller to purchase the island as a sanctuary. That same year Dr. Alfred O. Gross, renowned Bowdoin College ornithologist, made a study of the eider population, finding only thirty nests, where formerly there had been hundreds. Ernest A. Joy was installed as warden, and under his vigilance the nest sites of the eiders have increased to at least one thousand.

Students from Bowdoin made other studies of birds on the island. This adoption of Kent Island as a sort of ornithological laboratory, combined with the lack of success of Mr. Rockefeller's silver fox raising venture, resulted in the gift of the island to the college. Now it is the Bowdoin Scientific Station, an outdoor laboratory that has produced important information on many bird species, as well as in the fields of botany and geology.

The author, standing, left, with the staff on the island during the 1947 summer: John Carpentier; William K. Kirsher; Elliott Winn, who was studying black guillemots; Raymond A. Paynter, the field director of the station. Seated, Warden Joy and Peter Leisure.

Ruddy, weather-beaten Ernie Joy puts down his records for the day. Before him are his weather instruments. Ernie is a store of fascinating stories of the country, friend to the students, philosopher, and protector of the birds the year around.

In the laboratory Ray Paynter works on a herring gull skin, while Elliott Winn measures guillemot eggs. Below, Winn and Kirsher relax after dinner with some Nature literature, while Paynter busies himself with writing up the day's notes.



Carry, Ernie's housekeeper, takes from the oven some of her delicious bread. Below, getting supper. Carpentier and Leisure are on the spud-peeling detail; Winn inspects critically a can of tomatoes, while Kirsher and Paynter get ready to do the real work at the kitchen stove. Life and food are simple on Kent Island.

The northern end of Kent Island is covered with a dense growth of white spruce, under which, in the soft, peaty soil, nest about five thousand Leach's petrels. Atop one of the tallest spruces a raven makes his home, and golden-crowned kinglets also nest in these trees. Along the rocky shore, at the woodland's edge, are many herring gulls.

The central part of the island, where the buildings are, is more or less open. Diligent search in the surrounding grass may turn up the dome-shaped nest of the Savannah sparrow, or the homes of song sparrows. Tree swallows have accepted the hospitality of many of the bird houses erected for visitors, and barn, bank and cliff swallows are also to be found. Along the edge of the woods flit alder flycatchers, redstarts, myrtle warblers and blackpoll warblers.

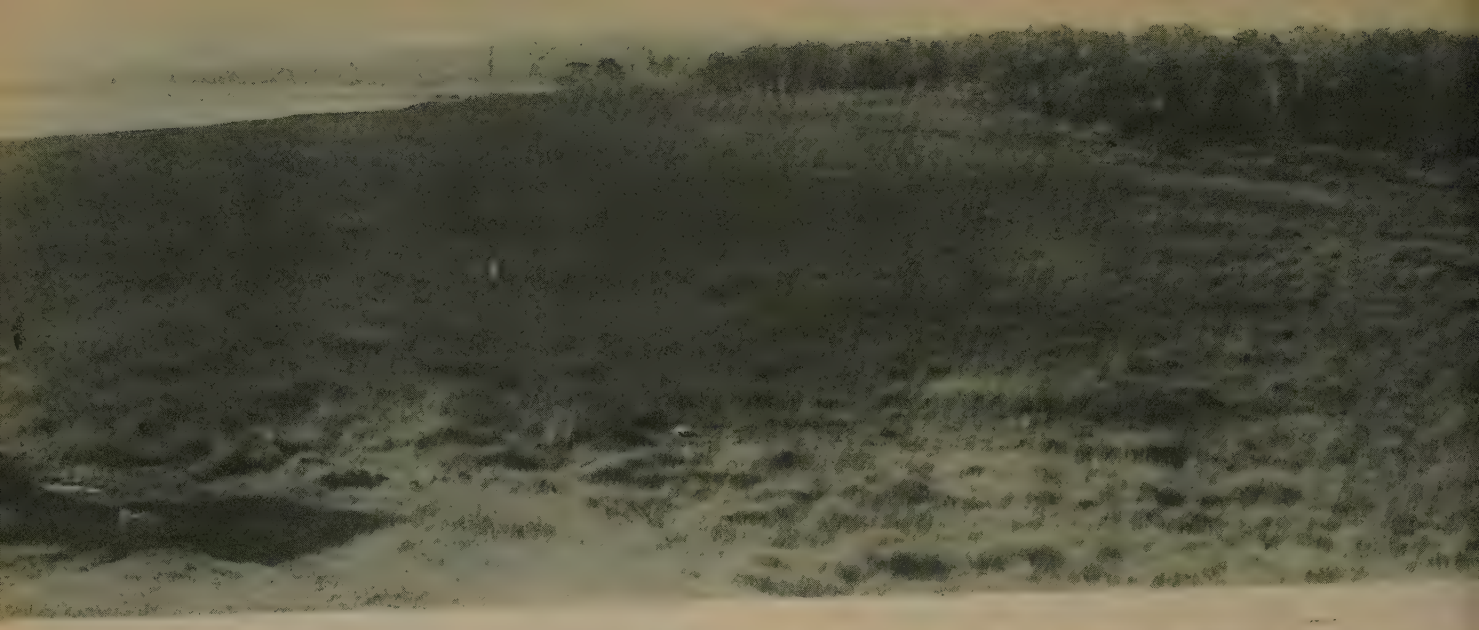
The southern end of the island is partly marshy. In July it blooms with a thick carpet of iris, dotted with white by nesting herring gulls. Eider nests are found there, too, and, on higher elevations, nests of the great black-backed gulls. On the rocky shore, where storm waves break in full fury, nest black guillemots.

Most populous are the herring gulls, some 30,000, constituting the largest colony on the Atlantic seaboard. Leach's petrels are the next most numerous of the residents, and the eiders third. The great black-backed gulls are relative newcomers, with only about thirty nesting pairs.

Besides Warden Ernie's home in the remnant of the old Kent mansion, buildings house the living quarters and laboratory for the summer students, radio equipment, tools and supplies. An old barn, built of hewn timbers with whip-sawed siding, provides dormitory, dining room, kitchen and study. In the latter a fireplace sends forth welcome warmth in the evenings when winds sweep the island, and the waves dash against its shores.

Elliott Winn examines the band on the leg of a black guillemo and, below, weighs two eggs of the bird on his delicate scale

Ray Paynter, right, puts a band on a young herring gull, the species with which he was working. Between 1934 and 1945, 34,557 young and 1635 adults were banded on the island. Returns from 1373 of these shed light on the travels of the birds, and whether they return to Kent to breed and rear their young. Below, some of the gulls and their nests, of which there are some 15,000 on the island. Offshore the fog is rising, beginning to reveal the island of Grand Manan, about ten miles away.

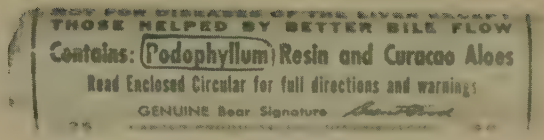


Across the top of these pages is a panorama of Kent Island. Above, female yellow warbler on her nest. This is one of the three warbler species found nesting on the island. At the left, a spotted sandpiper, the common sandpiper nesting in the United States. These birds nest on the edges of the stony beaches. Below is the nest of a barn swallow. Its mud nest is lined with the feathers of gulls. Cliff, tree, and bank swallows also raise their families there.

Song sparrows, above, at their nest. One parent is feeding the young while the other stands by with food in its bill. At the right, a herring gull alights. These birds are the most numerous of the avian residents on the island. Below, black-backed gulls and young. These, one of our largest gulls, nest about a month earlier than herring gulls. There are thirty nests on Kent Island, and these gulls are relative newcomers, having been recorded only since 1933.

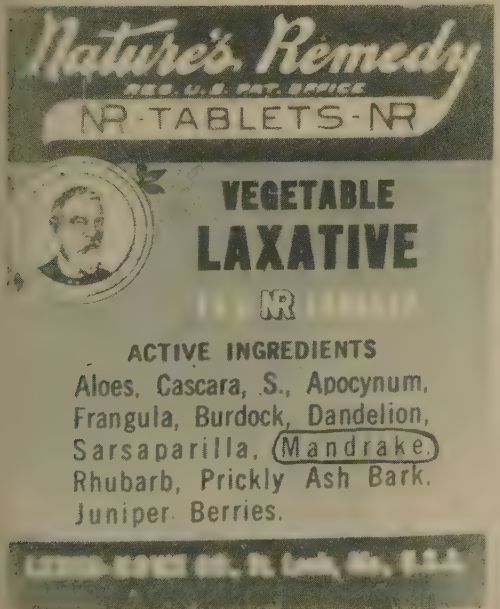
A stand of the handsome mandrake, or May apple, known to botanists as *Podophyllum peltatum*. It grows in patches, with the plants springing up at intervals from the underground root system. Under each plant is a rosette of roots, two of which may be seen pictured below. The stem scar from last year's plant is seen at the right, and from this darker section the roots branch out. Buds for next year's plants may also be seen. This year's stem and buds for new plants next year are at the left. The roots form an intricate network so that nearly all of the plants in a patch come from the same root.

Photographed by Arthur C. Parsons


THOSE HELPED BY BETTER BILE FLOW
Contains: Podophyllum Resin and Curacao Aloes
Read Enclosed Circular for full directions and warnings
GENUINE Bear Signature

Popularly the mandrake is also known as both May apple and umbrella leaf, the latter name coming from the size of its large leaves. Another name is wild lemon, which comes obviously from the appearance of its fruit as seen below. This fruit is a lemon-shaped berry that is fleshy and edible. However, both the leaves and the root of the mandrake are poisonous if eaten, but from the dried root is obtained a drug that is used in two medicinal items that find themselves on the drug store shelves. The labels of these are reproduced here, with special reference to the use of mandrake in one, and the more imposing name of Podophyllum in the other. There is a European mandrake, but the American form, according to manufacturers using it, produces a higher percentage of the Podophyllum resin, when properly dried. The leaves of American mandrake are often as much as one foot in diameter. The plant has flowerless stems that bear the leaves, which are peltate in character. This means that the stem is attached to the center of the leaf, umbrella fashion. The flower stalks, on the other hand, bear two less symmetrical leaves, as is seen in the picture of the flower on this page. Look for this interesting plant the next time you are in the woods within its range in a habitat such as the plant enjoys.

The blossom of the May apple, or American mandrake. The white flower appears in April or May and is most attractive. It is nearly two inches across and usually has six petals and twice that number of stamens. Unfortunately, however, the flower is almost as ill-smelling as it is handsome. The mandrake likes damp, rich woods, and is found in such locations from New York west to Minnesota and Nebraska, and southward. Strangely enough, however, it is not found naturally in northern New England, although it has sometimes been transplanted in this region.



Phlocus phalangioides as she was found in the cellar carrying the egg case in her mouth. This is actually quite inconspicuous since the spider, here enlarged, has a body about one-quarter-inch long, the egg case in proportion. The photograph shows well the thin egg-sacs, in which the young develop, to hatch and live for a time in the mother's web before striking out for themselves.

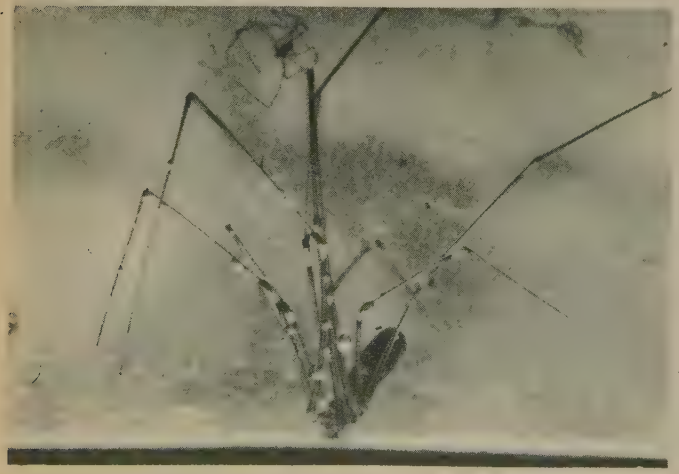
ALTHOUGH it can be mistaken for daddy-longlegs, and is most closely related to the house spider, the squint-eyed spider, *Pholcus phalangioides,* belongs to an entirely different family. It spins a loose web, which the daddy-longlegs does not, and its appearance is quite different from the house spider. It is found in warm, dark places, like cellars and under porches. It is useful as a destroyer of small insects, which blunder into the web. When prey enters, the spider jumps around, entangling it completely before killing the victim. The photographs here, made by J. Stofan in his own New Jersey cellar, show five phases of Pholcid life.

The eggs hatch into a jumbled mass of spiderlings, the female still holding the egg case remains.

The spiderlings scatter on the web the mother had used. Some may linger, others immediately leave.

The female *Pholcus* photographed taking a drink of water, which was sprayed on web and bottom of glass case.

A photograph of the spider as seen from above. This shows, considerably enlarged, the shape of the body.



As We See It

An Editorial

More Predator Control

MONTHS, perhaps years, of carefully conceived work by the friends of our birds of prey go for nought when some official of a state conservation commission comes forth with an article like "Get Those Predators," by Frank Blair, Director of the Division of Game and Fish for Minnesota, in the *Minnesota Conservation Volunteer* for January and February. This is the official publication of the Conservation Commission, and pronouncements in it by one of its officers carry weight.

Writing an article of this sort is a work of art, for in it the author says exactly what all the vermin shooters want him to say, and yet he says it in such a devious way that any definite statement concerning the shooting of birds of prey cannot be attributed to him. Writers of this type have learned one lesson exceptionally well in the past few years. They no longer come boldly forth recommending that all birds of prey be killed, but they talk about the edges of the subject long enough to be plainly understood by all the pest-hunters.

Take this statement for an example of saying what you want to say without putting it into so many words: "Certain hawks and owls" [please notice the statement—hawks and owls], "take their toll of birds, of these the great horned owl is first and the Goshawk number two."

In the same illuminating article Mr. Blair recommends that good sportsmen—all *good* sportsmen—must of necessity spend as much time in the field hunting predatory species as they do the more desirable game species. Of course, Mr. Blair fails, intentionally, to mention the predatory species that may be hunted, which allows the sportsmen with a scope-equipped rifle or a shotgun a wide latitude of choice.

Mr. Blair must have had on two pairs of rose-colored glasses when he was composing this article; at least, he seems to have a beautiful opinion of the intelligence of human beings, as witness this statement: "Man is the most predatory of all but he has, because of his intelligence, been taught that he has domain over all other species and that he is to conserve and manage all other species so that all mankind may obtain their legitimate share or requirements."

This must be the same intelligence that man used in his control of the great auk, the passenger pigeon, the eskimo curlew, the Carolina paroquet—now extinct—and the same intelligence that has reduced the numbers of the sea otter, the American bison, several upland game birds, and our waterfowl populations to the point of extinction, or to a dangerously low level in many species.

Mr. Blair forgets that this country is not inhabited, one hundred percent, by people who are interested in getting the limit of rabbits and pheasants each day of the hunting season, and every other day that they are sure the game warden is in some remote part of the county. How can he be so naive as to believe that human beings are intelligent enough to control predatory species when this same great intelligence allows a certain percentage of *good* sportsmen to hunt, in or out of season, the very species they are trying so valiantly to preserve?

Mr. Blair also forgets that there are those of us to whom the wild, free stoop of a hawk, or the deep and fierce *whoo-hoo-hoo* of a great horned owl (both of them native species) are far more beautiful than the silly, early-morning gabbling of a flock of ring-necked pheasants (imported). Mr. Blair is like the man who held up his foot for inspection, a foot filled with large, cruel thorns, and indicated that the smallest and slightest of these was the cause of all the pain and discomfort that he was suffering.

Mr. Blair, and his colleagues in other state conservation departments, must stop drawing red herrings across the path. They must come to the point and call a spade a spade even if it displeases the intelligent public. Let them consider the other and larger thorns in this foot—lack of sufficient cover, scarcity of game reservations, poor agricultural practices, too great a percentage of land surface under cultivation, daily bag limits that are too high, human game hogs, out-of-season hunting, and high pressure advertising that is encouraging a larger and larger number of people to take to the field each year.

The pitcher plant, one of the plant-eats-bug clan, has outclassed any cannibal by making the very pot in which its victims are killed so alluring that they jump in of their own free will.

The Missing Link in the Chain O'Lakes

By BETTY WILSON HIGINBOTHAM

You will not find the Missing Link Bog on any map of Michigan. It certainly was not on the large-scale map from which the real estate agent sold "lake-front" lots, sight unseen. The map, made years ago, clearly shows the area as open water, a link connecting other waters of the Chain O'Lakes. But when we were shown the lake-front lot it faced only a narrow piece of low land, with lakes barely visible at each end.

Something had happened since that map was made, and although the effect made neither the real estate agent nor the buyer very happy, it produced in a hurry what ordinarily takes Nature ages to accomplish, and resulted in the happiest hunting ground a botanist can find.

Twenty years ago the waters of the Chain O'Lakes could be traversed by boat from Silver Lake to Rainbow Lake, and Reed and Orchard Lakes. The link between Silver and Rainbow Lakes was long and, originally, probably wide enough to be regarded as a tiny lake in its own right. The link between Rainbow and Orchard Lakes was short and narrow.

Today the long link between Silver Lake and Rainbow Lake is a bog—the Missing Link Bog explored, botanized, quaked, and christened by the author.

Nature must love a bog, for here she reserves what to the botanist are her choicest plants, but ordinarily she takes hundreds of years, and even ages, to prepare the setting. The usual evolution of a bog, according to the most commonly accepted theory, begins with a pond that may have neither inlet nor outlet. An old lake is reborn as an infant bog, which should not be confused with a common swamp.

Plants soon encroach from the sides of the shore-bound lake, and their constantly decaying remains set up an increasingly acid condition in the water. This finally reaches the point where decay is retarded. Some plants, better adapted, grow out over the surface of the water and provide a mat for others to root in, a sort of floating garden. Time rolls on. Generations of men are born, bear offspring, and die, but still the bog remains young; the mat increases and covers the water surface but still continues to grow. It no longer fans out sideways but now pushes both upward and downward; upward from its normal plant growth, downward by its own weight. It presses down, deeper and deeper into the hidden black waters beneath, until, after long periods of time, the heavy mat of vegetation finally reaches the bottom, and then the bog, grown old at last, gradually dries up and is taken over by the dominant vegetation. By this time our old bog has evolved into a young forest.

The length of time required to accomplish the evolution of a bog from lake to forest can be vaguely gathered when it is realized that most of the "spade-

work" is done by a small moss — sphagnum or peat moss.

Once the bog is well stocked with Nature's finest from her floral collection, she relinquishes it only with the greatest reluctance of any of her domains. Forests may be cut, lakes drained, deserts irrigated, rivers rechanneled, and even mountains tunneled, but the bog, which yields so softly to the foot, actually yields only to time and not to man.

But man is impatient of time, and, except for the Nature lover, of the space occupied by a bog. An example of his impatience, and of a bog's persistence, occurs just outside Indianapolis, Indiana. Here at an old bog a real estate company saw possibilities of a beautiful "development," and thought to hasten Time by draining off the subterranean waters beneath the deep mat of vegetation. After the draining program was completed a paved street was laid across the center of the old and supposedly broken bog. Not long afterward the company officials visited the site and were greeted, not by the hard white surface of the road, but by a straight and deep stretch of open water, somewhere at the bottom of which repose their costly road-building efforts!

The adder's-tongue fern lifted its snake-like head and protruded its tongue of a fruiting stalk.

Such is the long-range program and tenacity of a bog.

But here in the heart of the Manistee National Forest in Michigan is a bog that only twenty years before had been a link in the Chain O'Lakes. What had hastened the usually long-drawn-out process of bog formation and broken the chain by severing a link?

So far only theory can provide the answer. Local talk has it that springs feeding the lakes have "filled up", causing a lowering of the water level. Michigan conservation officials, however, were called in, and their verdict has been that a series of years of drought during the period when the underground water table is most affected by rain (springtime) has caused a general lowering of the lakes. The visual result has been that the shallow necks at both ends of this particular link have dried up, leaving the much deeper central part isolated and vulnerable to the attack of vegetation.

While the lake water is presumably alkaline, since the little aquatic *Chara* flourishes and deposits deep accumulations of marl on the bottom, the waters of the missing link must have rapidly become acid by reason of the fast-decaying vegetation. When it became sufficiently acid a new ecological unit moved in, bog and boggage.

In a mere twenty years the stage had been set, and today, taking their bows from the winds, are leatherleaf and alder, marsh fern and pitcher plant, adder's tongue and cranberry, with each trying to steal the scene from the others. Of all of our native bog plants the cranberry seems to be the only one cultivated as a crop.

When we were looking over the "lake-front" lot it was from a hillside, and there was no evidence from a distance of the nature of the former "lake"—except that it was no longer water. Many of the typical bog plants have not yet had time to stake their claim to its territory; no tamarack lifts its pointed spire at the border like a country church steeple above its ancient graveyard. So we looked at the site in disgust and turned our attention elsewhere to exchange the lots for truly lake frontage. It was not until later that I found a clue to the true nature of this lost lake.

I had ambled along the beach of Rainbow Lake, stopping to tease a harmless and bluffing "spreading adder," when I spotted a sign that indicated "detour from the beach" as surely as any highway sign.

It was a pitcher plant, spreading its water-filled vases on the pure sand. But pitcher plants are not beach plants. This species, *Sarracenia purpurea*, is one of our most typical bog plants. In all the plant kingdom there is no more snobbish society than that to be found in a bog. A bog plant consorts only with its equal in the bog and is never found far astray; it

Overlooking the Missing Link Bog, with Rainbow Lake in the background.

never goes slumming into the roadsides, fields, or woodlands.

The pitcher plant could only mean that a bog was so close that its outskirts were brushing the beach. I left the beach immediately, heading toward the only open area I could see. As I walked along I watched for other infallible plant signs that would tell me I was getting "warm." The signs increased, the soil became not sandy but black, and not really soil at all but the dried and rotted remains of plants. The "ground" under foot became soft and springy, and made me want to bounce up and down on it like a child on a bed.

Sign after sign led me on. Tall, rounded alders overlooked the scene, smaller bushes of leatherleaf, *Chamaedaphne calyculata,* waved me on with their rapidly diminishing terminal leaves. Then, when I had to step gingerly from hammock to hammock to avoid soaking my feet, instead of walking on the innocently dry-looking clumps of peat moss, I knew I was in the bog proper. Sphagnum has a cell structure like a sponge, even better, and it is able to absorb many times its own weight in water without ever looking even damp. Because of its absorbent qualities it is harvested in large quantities from the wild in bogs and used by gardeners, greenhousemen, and even surgeons, since it makes excellent absorbent pads for dressings. The dried, semi-decayed bricks of peat are a common fuel in Ireland.

I wandered where I could without sinking too far in the soft sphagnum, which seems like walking on a soft summery cloud. The very word "bog" is derived from the Irish and Gaelic for "soft." Here and there black pools of water broke through the green plant surface. It is in such environments as this that the customary bug-eats-plant is reversed, for here plant-eats-bug.

The pitcher plant has out-classed any cannibal by making the very pot in which its victims are killed so alluring that they jump in of their own free will. The slender green vases are baited with an appetizing substance (to an insect). Along comes one and in he hops, under the mistaken impression that he is going to get a bountiful free meal, only to find he cannot escape and that he himself is to become the meal. Some early botanists who saw the "pitchers" of insects jumped to the conclusion that these had sought refuge there from pursuing frogs and that the plant served as a haven.

Near the center of the Missing Link Bog a tiny streamlet gathered a weak force of water from below

The cranberry, a bog plant that has gained economic importance and is now cultivated as a crop.

and meandered, less than an inch deep, through the sedges and grasses, shortly to lose itself again under the surface.

As I approached the streamlet its bed heaved with my footfalls. The heaving stopped abruptly, as I did, while I surveyed this bit of earth that I was able to quake at will. It was so black and still it looked like nothing but a bed of mud. Over the mud, which must have resembled the primordial "ooze" of evolutionists, crept an intricately formed plant that possesses the most delicate mechanism imaginable for the trapping of animal life.

This member of the plant-eats-animal clan was one of the bladderworts, *Utricularia intermedia.* For all of its superb development it was a tiny little thing, spreading dissected fan-shaped leaves over the mud and producing numerous little milky colored "bladders." Its bladders are innocent-looking, flattened sacs attached to the stem, but their business is death, destruction, and digestion, in chronological order.

The little sac or bladder is equipped with a door, the latch to which is a bristle. Comes a happy animalcule swimming this way and that in search of food and then he gets a whiff of a syrupy substance. In all haste he follows his nose, or whatever serves an animalcule for a nose, until he accidentally brushes against one of the bristles. He has not even touched the door yet; he has no need to; it has been automatically swung open for him to enter. Like the invisible ray doors in Pennsylvania Station, this one opens when a prospect nears its portal. Here the similarity with the station door ceases. At the station one may enter or not, as he pleases; at the bladder the animal is forced in, willy nilly, sometimes head first, and there was no shoving, either. Instead of a shove there was a pull, and the pull came from the inside of the bladder, which somewhat resembles a little vacuum. When the bristle was disturbed the door swung open and both water and animal were flushed inside. The door closes and that is the end of our animalcule. The bladderwort finds it a good ending.

Some scientists have suggested utilizing this complicated mechanism for the benefit of man. It is known that many mosquito wrigglers or larvae are caught by this plant, and it has been thought that a widespread use of the plant would reduce the mosquito population.

Nestling in the moist clumps of sphagnum the round-leaved sundew, *Drosera rotundifolia,* spread its glitteringly jeweled leaves. Like all jewels dangled enticingly before eager eyes, there was a catch to these, and a very sticky and fatal catch. The dazzled insect, lured by the honeyed, glistening drops, ventures into the snare, the false jewels move on slender stalks and close in on the hapless bug until it is enmeshed and digested.

Man has already put this insectivorous plant to work for him, but in a most peculiar way. In some countries the leaves of the sundew are gathered and added to milk, which they solidify much as rennet does. This action is a sort of digestive process, which the plant performs on the milk in the same way as it would upon insects. Since man has found the curdled milk pleasant to eat, the plant is not allowed to enjoy the fruits of its labor.

In the center of the bog I found tiny cranberries mingling with dainty marsh ferns, and learned at the same time that bogs are treacherous not only for man and insect but also for cameras! The Missing Link Bog decapitated my photograph of a marsh fern. Fully in view in the ground glass, the tip was thrown out of range when I leaned forward to adjust the shutter and the tripod leaned with me on the yielding bog surface.

Here and there the aberrant adder's tongue fern, *Ophioglossum vulgatum,* lifted its snake-like head, and protruded its tongue of a fruiting stalk.

A delicious fragrance was traced to the deep maroon, star-shaped flowers of a bog cinquefoil, *Potentilla palustris,* whose five-fingered leaves had already been raised to gain attention.

Heavenly blue tubular flowers, although borne in the axils of leaves on opposite sides of the stems, were sociable by nature and turned their individual stalks until the blossoms stood in snuggling pairs like love birds. A little bill on their cap-like calyx proclaimed them one of the skullcaps, *Scutellaria galericulata.*

Nowhere did I see any of the orchid family, usually so fond of bog life. Perhaps the bog was not yet mature enough to flaunt these most formal of our flowers on its shoulder. The edge of the bordering woods, however, had, a month before in early June, been the haunt of a pink ladies' slipper orchid, while the neighboring beach a month later, in August, produced the strange-scented little ladies' tresses, *Spiranthes cernum,* with its drawn-out curl of tiny blossoms.

Young as the Missing Link Bog is, as compared to other bogs, man prefers to grant it only the briefest existence.

To restore the link between the lakes to a more liquid state is quite naturally the desire of both fishermen and property owners. Following the local assumption that "filled in" springs were the cause of the lowered lake levels, it was suggested that these springs be dynamited on (Continued on page 272)

In the Hospital

By SISTER M. PASCAL

Came a bird song through my window,
From the mountain ash above,
Lending pinions to my Matins—
Challenging the world to love.

Just a cardinal, wintering northward,
Praising God for daily bread;
He among the crimson berries,
I, in my white iron bed.

Boy-Planned Vacation

By DOROTHEA SHEATS

Photographs by Paul Douglas Sheats

THE boy and the woman trudged wearily up to the weathered marker on the High Sierra Trail in Sequoia National Park. The August sun had already dropped behind the bleak range of the Great Western Divide; shortly it would be dark.

"Five miles to Bearpaw"—the sign was brief and upsetting.

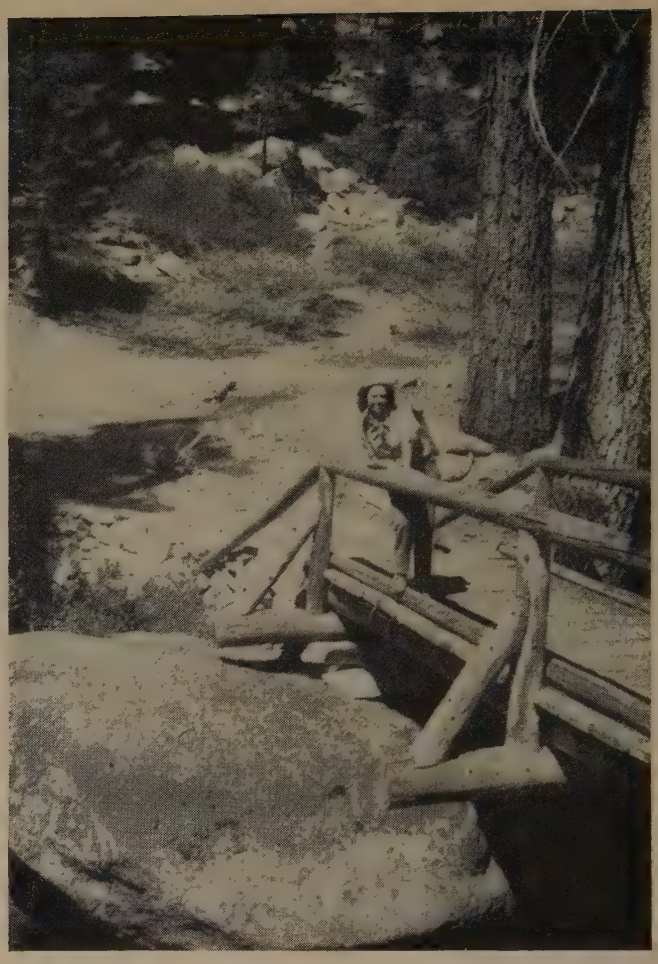
They had been watching for this marker to tell them they would be safe from the unknown mountain night at Bearpaw Meadow Camp in a few minutes; sitting down to a hot meal, later sleeping in warm, snug beds. They stared incredulously. It must be wrong. They turned to the map, accusingly. It was here they learned that a tiny worm's turn of a line on a Geological Survey map may mean a thousand-foot climb, or a comma-like mark a whole canyon.

Even now the boy started on, a new determination in every step. But the woman sagged against a rock. Five more weary, dusty, heel-rubbing miles. Grimly, she asked herself, "What am I doing out here in this wilderness? How did I get into this, anyway?"

How did I?

It began in a Washington, D. C., apartment on a Sunday morning in May. Paul, my fifteen-year-old, who had been reading the story of John Muir's life, said, "Mom, we've never had a real vacation together. Let's take a hike in the High Sierra—say, Sequoia or Yosemite!"

Talking about hiking seemed safe enough. But the thought occurred to me, as he developed his idea of a real vacation "with mountains and no people," that a boy-planned vacation might be something for him to remember always; that it would be a special experience for us to "discover" the mountains together.

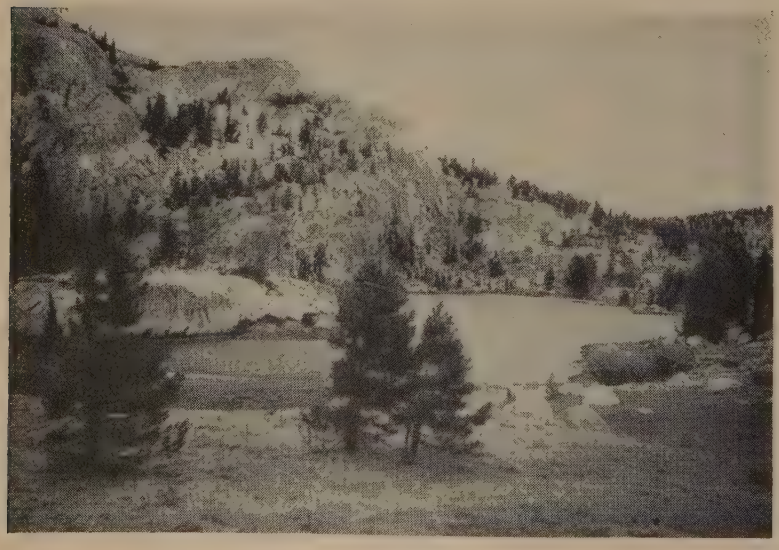


"Mom" rests a bit on the bridge crossing Snow Creek, high in Yosemite National Park.

But I had misgivings. I had never really hiked. Already I could see Paul streaking over a mountain, with me a slow-moving dot far behind. In spite of this, the plan got started. It sat at our breakfast table, followed us through our day, and gathered to itself a fast-growing pile of woolen socks, knapsacks, notes and folders.

Cautiously, I talked to people at the National Park Service, bought maps and borrowed books from the public library. Aubrey Drury's *California, An Intimate Guide; Steep Trails,* and others by John Muir were some of these. Paul read them, and many more; and made long lists of equipment.

From these latter it became clear that I would carry a sleeping bag and much kitchen plunder. There must be another way, I kept repeating. My mental picture grew more complicated. I was not only slow, I was top-heavy.



Booth Lake as seen from Babcock Lake Trail, a part of the boy-planned itinerary in Yosemite.

In the Yosemite high country. A meadow at 9000 feet near Tuolumne Pass in Yosemite.

In reply to my desperation Paul suggested that we stay at Bearpaw Meadow, a permanent camp at about 7800 feet elevation, in Sequoia National Park, and, in Yosemite, hike from one High Sierra Camp to the next in the rugged region above the Valley.

This would mean light packs with only clothes and a miscellany of camera, film, Roger Tory Peterson's *A Field Guide to Western Birds,* flashlights, notebooks and a first-aid kit. I made reservations for late August, at once fearing and hoping that we would pick them up when the time came.

It did come, and we really reached Bearpaw after that first day of more than fourteen miles—Paul, with the conviction that we were certainly not hikers; I, as I cut little squares of moleskin for my blistered heels, convinced that this pioneering called for stamina, indeed.

But that first day's walk had a certain charm no other day quite touched. We were so blissfully ignorant of the passing of time. We dallied too long on the trail and lost precious hours as Paul took many pictures. We took time to watch lizards dart across our path, or stood very still when a large deer sailed over our heads into the brush above. Our lunch was eaten leisurely, and we filled our cups at every gushing spring. At Panther Creek and Buck Canyon we pulled off socks and shoes, and gasped delightedly as the icy ripples chilled our burning feet. Once a whirring sound startled us.

"There they are," Paul whispered, "our first Sierra grouse." I almost missed them, for their dark gray color blended into the natural rocky ridges. We tried to identify new trees and found fewer sequoias and more pines and red fir as we ambled along. We stretched out on great smooth boulders and talked or just listened and forgot everything except sky, and trees and mountains. That is, until we met that distressing sign.

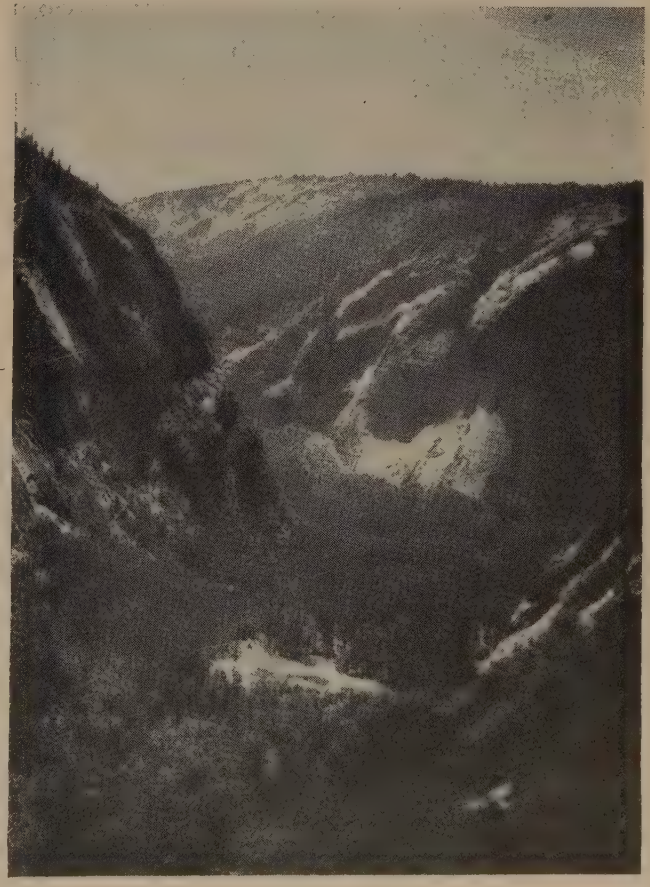
If our entrance to Bearpaw was bedraggled it was well-timed. A mouth-watering dinner of ham, potatoes, corn, homemade bread and jam was on the table in the dining tent. A warm rosy glow, spread from the sky, included us. Our recovery, over apple pie and coffee, was amazing.

The next morning we started early—our first lesson—for Hamilton Lakes. It was a four-mile trip up to the group of three lakes, set, emerald-like, one above the other, in the mountains. This was fisherman's country, with golden trout lurking in the green depths. Paul climbed about 1500 feet on up the trail to Kaweah Pass, while I waded happily below at the middle lake, and we started back to Bearpaw in plenty of time. We sat up late talking that night. A full moon edged dramatically over the range, which faced us on the porch of the main tent.

"Have you ever had to face any emergencies up here?" I asked the capable hostess, who has been in charge of the lonely camp during its June-to-September season for the past twelve years.

"That depends on what you call an emergency," she said. "Once we had a spinster lady come up on mule-back. She woke me up three times one night—insisted she had to have another pillow—that hers was uncomfortable. I felt it, poked it. We had a full house;

Lower Tenaya Canyon seen from the trail switchbacks. In the background is Yosemite Valley.



there were no extras. When she came with that pillow the third time I just took a knife and slit it open."

"What happened?"

"A mother chipmunk and three babies crawled out!"

Our return trip from Bearpaw was managed with little wasted motion or time. We left camp early that morning, and in the afternoon were in an attractive cabin in Giant Forest Lodge. Next morning we started by bus for Yosemite, to begin the second and more ambitious lap of Paul's plan.

Once there, we had to explore Yosemite Valley together. I bought new shoes; the forty miles of walking we had just finished were too much for my "extra" pair.

The few hours we spent at Le Conte Memorial Lodge, headquarters for the Sierra Club in the Valley, were most interesting. Here we learned that a good tramper rarely sits down to rest on the trail, that he leans or eases his pace, that bursts of speed are energy-consuming.

We could have spent days in the Museum; the many vivid pictorial representations of the formation of the Valley, the lifelike birds and mammals, the library, even the marvelous old mountain sheep found preserved in a glacier, dating back some 4000 years, tempted us to stay longer. But one morning we started out.

We set out from Happy Isles in the Valley and followed the Mist Trail along Vernal Falls, past Nevada Falls, into the Little Yosemite Valley and on our way. This was an easy trail—flat, but rocky in spots. The friendly Merced River stayed within sight and sound much of the way. Its white water was sadly lowered by the prolonged drought. Now and then aspen groves, brilliantly yellow in the hot, dry air, made contrasts with pine and fir and the unchanging blue sky.

Along the trail a saddle party overtook us. The college students and business girls greeted us, even as they resented every bone-jogging step their mounts took. We smiled back and felt superior, for we had mastered the trail on foot. After you walk across a mountain you feel you are part of it.

Merced Lake Camp is located on the extreme right-hand side of the fifty-mile horseshoe that includes the semicircle of permanent camps maintained in this primitive country north of the valley. It was one of two camps remaining open after Labor Day.

Here twenty-five cents paid for a shower. Water from the chilly Merced came out piping hot even while the evening temperature dropped to twenty degrees above zero. That was a true morale-raiser for the bone-tired hiker. The food, too, was plentiful, delicious and fortifying. The next morning, before we started out on a day-long excursion, we ate prunes, hot cereal, huge stacks of wheatcakes, sausage, rolls and coffee—all for $1.50, and served family style.

After a short three miles we found Lake Washburn, where wind whipped little waves against a sandy, white beach and bent high dune grass. We almost forgot this was in the mountains as we explored the shore.

Back in camp that night, songs and stories kept us listening until ten o'clock around a blazing log fire. The night was cold and starry; we were all tired, but the magic of the fire and company kept us there.

The other High Sierra Camp remaining open was Tuolumne Meadows. Earlier in the season it is possible to walk eight miles to Vogelsang Camp, and then seven to Tuolumne, but threat of snow had closed the nearer camp. Fifteen miles would be grueling, I knew, but we were in stride, I told myself.

On the lonely stretch to Tuolumne Paul broke his watch. He had been climbing over boulders to see a water ouzel thread in and out of a waterfall in the rock-laced Merced. Now haunted with the thought that night might find us still on the trail we set out at a rapid pace. It was cold and gray and we passed no one.

But we saw other things. A bobcat disappeared over some rocks on our right. Bear tracks mingled with our own on the switchbacks, and a dozen small animals—conies, chipmunks, squirrels—scurried before us.

By the time we reached Tuolumne Pass we were very hungry, but there was no water to wash down our sandwiches.

"The Survey map shows springs and water holes," Paul said, stopping to read the map.

Near a dry creek-bed we finally found a little trickle of water dripping from a ledge to a mossy basin in the rocks. We tried to make ourselves small to wedge down out of the sharp wind sweeping across the open valley. We were at 10,000 feet, with our jackets zipped right to our chins. Finally, we came, literally exhausted and panting, into the Meadow and learned it was just four o'clock. We had been traveling at about two miles an hour.

The next morning I thought of easing my tired feet in a tour around the valley, but our days were running short and Paul's plan called for climbing a mountain. The mountain was Mt. Dana, some 13,000 feet high, on the edge of Tuolumne Meadows.

Clark's nutcrackers, strik- (Continued on page 276)

Mountain Storm

By VERNON C. HOYT

Lace shadows creep and dance as cedar leaves
Wind-kissed are tossed against a summer's sky.
Made suddenly aware by wrinkled sleeves
Of thunderheads that thrust a gray reply,
To mountain green . . . the yawning canyon's maw,
The stream's capricious counterpoints defy
The dulling light. And fast in cloudy flaw
The sky is dark, the lacy shadows die.

And far below stretch thirsty, dusty plains
Whose tillers watch the hills for sign of rains.

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Venus at Greatest Brilliancy

By ISABEL M. LEWIS

On May 18 Venus will reach that point in its orbit where, as viewed from our planet, it attains its greatest brilliancy. There are two such positions, and two times of greatest brilliancy for each revolution of the planet around the sun as viewed from the earth. One occurs when the planet is in the evening sky about 39 degrees east of the sun and 36 days before it comes into inferior conjunction with the sun. It will be in this position at time of its greatest brilliancy on May 18. It will be then about 40,000,000 miles from the earth. This is a little more than a month after the planet was farthest east of the sun, or at greatest eastern elongation. At that time its angular distance from the sun was about 45 degrees. Venus viewed through the telescope at greatest eastern elongation has the same phase as the moon at first quarter. At time of greatest brilliancy its phase is the same as that which the new moon has attained when it is still a crescent about five days old.

The next time of greatest brilliancy of Venus occurs about 36 days *after* inferior conjunction, and about 33 days *before* the planet is farthest west of the sun, or at greatest western elongation. The planet will be again about 39 degrees from the sun, but this time west instead of east of it, and the crescent again will resemble that of the moon when about five days from new moon. The only difference will be that on this date, July 31 this year, Venus will be in the morning instead of the evening sky. Inferior conjunction comes about mid-way between these two positions, on June 24, and earth, Venus, and the sun are then in line, with Venus between earth and sun. After the planet is at greatest brilliancy in the evening sky on May 18, it draws in very rapidly toward the sun and is nearer to the horizon at sunset on each successive night. It decreases steadily in brightness, but

is still so brilliant as to be visible close to the horizon within a few days of inferior conjunction. The planet will have, at that time, the phase of new moon.

It is a matter of mathematical calculation, involving the distance of the earth from the sun, and Venus from both sun and earth, to find when Venus has its greatest brilliancy. At the time Venus is in superior conjunction with the sun it is in line with earth and sun, with the sun between the two planets. It then has the phase of the full moon, but cannot be seen from the earth because it is lost to view in the rays of the sun. At superior conjunction it is 160,000,000 miles from the earth as compared with 26,000,000 miles at inferior conjunction, when it has the phase of new moon and is again invisible from the earth. The apparent size of the planet's disc increases tremendously during the time Venus is passing from superior to inferior conjunction. Throughout this period it always remains in the evening sky, first increasing its angular distance from the sun up to time of greatest eastern elongation, when it is farthest east of the sun, then decreasing its distance from the sun again as it draws in toward inferior conjunction. The phase of the planet, when seen telescopically, is gibbous between superior conjunction and greatest eastern elongation, at which time it has the phase of half-moon. It is in the crescent phase from that time on to the date of inferior conjunction. On that date the apparent diameter of the planet is about six times greater than it was at superior conjunction. There comes a time, while the planet is in the crescent phase, when the illuminated area of the crescent reaches a maximum, and that is the time of greatest brilliancy. After that, although the crescent continues to increase in length, it becomes thinner and decreases in total area of the illuminated part. As a result, the brilliancy of the planet begins to decrease as it draws in toward inferior conjunction and the phase of new moon.

Venus, whenever it is visible, whether in the evening sky before sunset or in the morning sky before sunrise, is at all times so brilliant that no star or planet ever approaches anywhere near it in splendor. Although it varies in brightness more than 2½ times in the course of one revolution around the sun, as seen from the earth, it is, even when *least* brilliant, twice as bright as Jupiter at its brightest, or Mars at its most favorable opposition. No other celestial object, excepting, of course, the sun or moon, or some object of great splendor, such as an exceptionally brilliant fire-ball, the head of some great comet, or an unusually bright nova, ever compares with Venus in splendor, and no object comes closer to the earth, with the exception of the moon and an occasional asteroid or comet. So dense and opaque is the atmosphere of Venus that it is doubtful if its surface has ever been glimpsed. Its period of rotation on its axis cannot be determined from observations of markings because there are no definitely defined markings, as is the case with Mars, for which the rotation period is accurately known. From the fact that some heat is radiated from the dark side of Venus it is believed that its rotation period does not equal its period of revolution around the sun, as does that of Mercury, but is considerably shorter, although it is much longer than that of our own planet.

During the second half of May, Mercury will be in favorable position for observation in the evening sky. On May 28 it will be at greatest eastern elongation and will then be around 23 degrees above the western horizon at sunset and a little north of west. It should not be difficult to pick it up in the evening twilight at this time, and for some time before and after this date. It will much resemble Vega, both in color and in brightness.

Mars will be found a little west of the meridian at sunset the middle of the month and sets near midnight. On May 15 it will be about one degree north of Regulus in Leo and is moving eastward. By the end of May it will have decreased in brightness so much that it will be only slightly brighter than Regulus.

Saturn is now a few degrees west of Mars, and the distance between them is increasing rapidly because of Mars' rapid motion at this time. Saturn has by this time surpassed Mars in brightness. Jupiter is now in Sagittarius. It rises in the southeast about ten o'clock in the evening and will be seen low in the south for the remainder of the night.

An event of special interest and scientific importance this month will be the annular eclipse of the sun, which occurs on May 8-9. As the path of this eclipse will cross the international date line it will occur on May 9 in Asia in the morning hours, and in the eastern Pacific and Alaska in the afternoon of May 8. Partial phases of this eclipse will be visible over nearly all of Asia, the East Indies with exception of most of New Guinea, the Philippines, Japan, Alaska, northwestern Canada and the north polar regions. The path of the annular phase will first touch the earth at sunrise off the coast of southern Burma and will cross (Continued on page 272)

The Designer

By JOHN GALLINARI WHIDDING

When God designed the universe, He laid
Black velvet for the background of His whim
And called it darkness. Then He gaily made
A sapphire bowl to hold the sun for Him,
And painted far horizons 'round its rim.

Now, being so much wiser-than-the-wise,
He made the bowl of day so nearly right
That when He trimmed the edges just to size
The scraps fell down, all glittering with light,
And caught upon the velvet of the night!

Camera Trails

By EDNA HOFFMAN EVANS

WHEN you believe in something, stand up for it. Maybe there is a fancy quotation in Latin, Norman-French, or some other language to that effect, but modern English is good enough for me. I try mighty hard to follow that ideal, and I am always glad when others do the same.

That is the reason I was highly pleased when "Minicam Miseries" in the January issue brought letters from 35mm camera fans sizzling into my mail box. I like to see people stand by their beliefs and back them up with photographic proof, as two of my correspondents did.

Strangely enough, two letters came from Atlanta—one from Atlanta, Georgia, and the other from Atlanta, New York. Both, I think, are worth quoting at length and from them I hope other "Camera Trails" readers will derive helpful information as to how to use their own miniature cameras to the best advantage.

By way of recapitulation, the criticism of miniature cameras given in January was that, insofar as Nature photography was concerned, "with anything smaller than a Great Dane at three feet (closest focusing distance) you have an enormous amount of blank space, but can't get close enough to really take a picture of the subject."

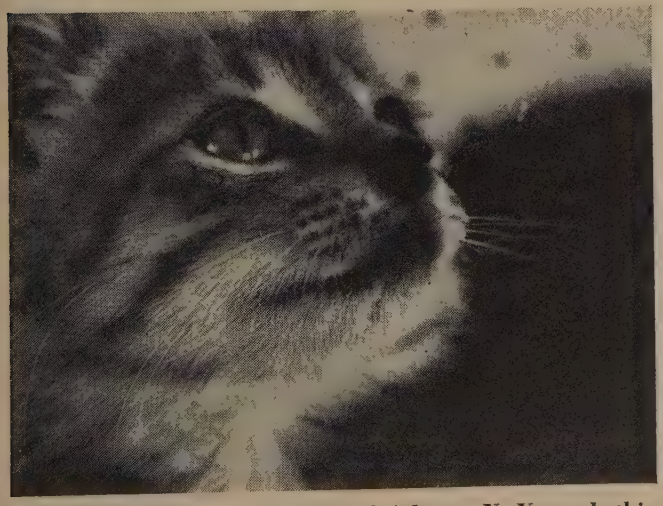
On January sixth, Mrs. Glenn Hamilton of Atlanta, New York, took her pen in hand and wrote as follows:

"I have just received my January *Nature Magazine* and after reading the article on Minicam Miseries in 'Camera Trails' I am up in arms and hereby send these three photographs in defense of 35mm cameras.

"My husband and I have had a Kodak 35 for a little over a year and can, with the voice of experience, sing its praises. We have several auxiliary lenses called Portra Lenses, which are not very expensive. They can be adapted to our Kodak 35 and with them we can get as close as to within six inches of a subject.

"The kitten picture is a full 35mm negative and was taken with a +1 Portra lens at six inches. We have enlarged this picture to 11 x 14 and it is sharper and clearer than ever. The two flower pictures were taken in the same way. The close-up of the phlox blossom was taken at six inches, while the potted coleus plant was taken at 12 inches with a +3 lens.

"We take Nature and animal pictures for the fun of it, and we do portraits and groups of people for profit. We use our 35mm for all of our work and wouldn't trade it for any other camera."



Mr. and Mrs. Glenn Hamilton of Atlanta, N. Y., took this picture with a Kodak 35, with an auxiliary Portra lens at six inches. They would not trade their minicam for any other type of camera.

Field Scout Executive Paul F. Runge of Atlanta, Georgia, sent this picture, and three others, to show what a 35mm. camera can do in Nature photography. He used a Kine Exacta camera.

The next day in Atlanta, Georgia, Paul F. Runge, who is Field Scout Executive for that particular area council, Boy Scouts of America, sat down to his typewriter and launched into an equally spirited defense of 35mm cameras. Wrote he:

"This letter is written because I find myself in disagreement with a generalization in a recent 'Camera Trails' statement. . . . I have owned several good 35mm cameras, all the way from an inexpensive pre-war Argus to a Kine Exacta, and I have had very good results with all I have used.

"The secret of Nature photography with the minicam is the use of supplementary lenses. Commercially available in +1, and +2 and +3 diopter, the amateur need not limit himself to these alone since he can have spectacle lenses ground to 5, 8 or even 10 diopter power so that almost incredible close-ups may be made. That eliminates the complaint of 'all white space.'

"Parallax must be taken into consideration since the view finder is inaccurate at close range. I have used gadgets with the Argus which determined the field and the distance automatically for a given supplementary lens and a given focus setting.

"While all four of the inclosed pictures are only 5 x 7, I have enlarged a number of others to 8 x 10 without any great difficulty. I do heartily agree with you that it is almost necessary for the minicam Nature photographer to be his own finisher for the best results. All of the inclosed pictures are enlargements from *portions* of the 35mm negative. The use of ultra fine grain film of the panatomic type with fine grain developer explains the lack of graininess.

"The minicam has several points in its favor. With its short focal length, its depth of focus at relatively large apertures is amazing, even with the supplementary lenses. I mean amazing when compared with some of the larger, longer focal length lenses under similar circumstances. Most of the inclosed pictures were shot at a working aperture of f/5.6. My negatives show that I could have stopped down to f/8 and still had enough exposure; I would also, of course, have had greater depth of focus.

"The Exacta, being a single lens reflex type, simplifies the problem of focus and the field to be taken. I have used it almost exclusively in the past year and have taken some 1000 negatives and color transparencies with it—with a minimum of expense and with a greater degree of ease than would have been possible with a larger camera.

"I don't mean to discount the Super Ikonta, or the Graphic-type cameras with double extension bellows and ground glass focusing. I have had dismal luck, however, in using this type.

The Kalart Company calls this the "camera of tomorrow." It has a number of new, built-in features, including the Kalart range finder, speed flash and focuspot.

I'd get focused and then never have my subject where I wanted it by the time I got the film in and the slide pulled. There are a number of tricks of the trade which may be used, and I do use them—but speed in taking the picture is usually a vital element to be considered. I have access to a Graphic-type camera but seldom use it for Nature work.

"I don't mean to infer by the foregoing that I consider the mini perfect for Nature work. Far from it. Your statement that the perfect camera for Nature work has not yet been developed hits the nail on the head."

And thus we have two ardent boosters for the miniature type of camera. They believe in their equipment, and get good results. No doubt many other photographers have similar loyalties to their own cameras, be they large or small, fast or slow, expensive or priced in the lower brackets.

It was nice to hear from Mrs. Hamilton and from Scout Executive Runge. I hope other "Camera Trails" readers will feel the urge to take pen or typewriter in hand, to sing the praises of their own pet cameras. As I said before, I am for standing by what you believe in.

CAMERA OF TOMORROW

"Camera of Tomorrow" is the title given the new camera now in production at the Kalart factories, Stamford and Plainville, Connecticut. And, from appearances and description, tomorrow's camera ought to be a good one, adaptable for Nature as well as for other types of photography.

Built right into the new camera are such former "accessories" as the Kalart range finder, speed flash and focuspot, plus other features intended to prevent film or bulb wastage and picture missing. Original idea for the camera was conceived a dozen years ago, and into its development went suggestions culled from a four-page questionnaire sent to, filled out and returned by hundreds of professional and amateur photographers.

The camera has a 127mm, f/4.5 Wollensak Raptar coated lens, and a shutter speed ranging from one second to 1/400th, plus bulb and time. A new type superimposed image range finder with automatic image size adjustment permits range finder focusing on subjects as close as 30 inches from the ground glass.

There are two focusing windows, and two shutter release triggers, one on each side of the camera. There are also two sockets for holding flash reflectors, and these may be used singly or simultaneously. Furthermore, by means of the Kalart aerial frame viewer, the photographer can use both eyes. Thanks to the working of an "electric brain," when taking pictures without flash, the shutter cannot be tripped unless the film holder is inserted and the slide withdrawn. In using a flash, the bulb will not work unless the shutter has been cocked, the film holder inserted and the slide withdrawn.

The camera uses 3¼ x 4¼ sized packs or cut film, has 850 parts, and weighs four pounds, 13 ounces, complete with lens, shutter and batteries.

With all the built-in features of this "Camera of Tomorrow," about all that remains for the camera of day after tomorrow is something that will make it come when the photographer whistles.

STORE-AWAY ENLARGER

For camera fans who have to make the kitchen or bathroom pinch hit for a regular darkroom, the new Model 269 store-away Federal Enlarger is a boon. It can be set up in as short a time as 39 seconds and, when not in use, can be stored in a space 8 x 15 x 20 inches.

Federal 269 comes with a Decar f/6.3 anastigmat (3 element) enlarging lens, and sells for $39.50, tax included. It takes negatives up to 2¼ x 3¼. Its bellows permits lens movement from a minimum distance of two inches to a maximum of five and a half from the negative. Enlargements of about 14 times can be made at the baseboard, and even greater ones can be made by projecting to the floor. The 30-inch tubular steel upright post is detachable in two sections, with a new type spring union joint. It is this latter feature that gives the new enlarger its compactness.

SCHOOL CONTEST

From Eastman comes a belated announcement of the third annual national high school photographic awards, closing date of which is May 7. The contest, open to all high school pupils, offers prizes totaling $3500 (grand prize $500) in five classes: school projects; people, old and young; scenes and still life; animals and pets; babies and small children. It is late, but I hope some young "Camera Trailsmen" have already planned to enter the contest.

Oops! In closing, let me correct a misstatement made in January. Manufacturer of the Bolsey Model B 35m camera is the Bolsey Corporation of America, 118 East 25th Street, New York City.

N. Y. Botanical Garden

From the New York Botanical Garden comes anouncement of several fascinating programs, illustrated with colored films and slides and presented by a speaker from the Garden. We assume that the availability of these lectures is confined to a reasonable distance from New York City, but all details may be obtained from Mrs. Edward Jerome, program director, New York Botanical Garden, 801 Madison Avenue, New York 21, N. Y. Also comes to hand a concise little booklet about this splendid Garden. It is entitled *Facts* and outlines the work and attractions of the Garden. A copy is available on request to the address above.

Tussle on the Lawn

Sitting by the window on a cold, rainy, spring day in Altona, Manitoba, A. J. Krueger was watching a group of a dozen or so robins digging worms in the lawn. He noticed an English sparrow flying from robin to robin, and, watching him, saw that the sparrow would wait quietly until a robin pulled out a worm, then would dash in and try to grab the prize. There always followed a tussle, the robin being successful in hanging to the worm every time except once. But the sparrow kept trying, until one robin finally lost its temper, grabbed the sparrow by the neck and mauled it so badly that it finally departed, having had a lesson.

Archbold Station

In 1941 the Archbold Biological Station was established for research in biology, and to provide facilities for visiting investigators in subjects best studied in southern Florida. It is directed by Richard Archbold and financed by him through Archbold Expeditions, a non-profit corporation affiliated with the American Museum of Natural History. Full details may be obtained from the Station, Box 13039, Lake Placid, Florida.

Trail Walkers

As usual Ernest A. Dench, Ho-ho-kus, New Jersey, director of Woodland Trail Walkers, has sent us his list of hikes for the new season. As always, these sound most fascinating and diverse. Hikers in the New York-New Jersey region should get in touch with Mr. Dench.

The School Page

By E. LAURENCE PALMER

Professor of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

A NEW FUERTES DRAWING

Most Nature-minded folk have been influenced by pictures. Most artists are influenced by other artists. But for years the Nature artists did little to change the style of their predecessors. Louis Agassiz Fuertes jumped over the traces in this respect. Until his time most Nature artists "mapped" their subjects, but failed to draw portraits that expressed any sort of "personality" on the part of the subjects. Audubon was a mapper if there ever was one.

When Fuertes began drawing, in his high school days, one of the first pictures he made was of a passenger pigeon. It was combination of pen and brush work, and, of course, did not equal the work that came from either of these methods used by Fuertes in later years.

Probably Fuertes is best known for his paintings. Many of us collected sets of bird pictures that came with baking soda, later adding pictures that came with some popular drinks, or with other common articles of trade. Many of the better of these little pictures in color were made by Louis Agassiz Fuertes.

So successful was Fuertes with the brush that he found little demand for use of the pen. However, when Anna Botsford Comstock had published her *Handbook of Nature Study* she conceived the idea of preparing something to serve as a loose-leaf workbook. She wanted outline drawings that the children could color, and she turned to her friend Fuertes for the pictures. Eventually there appeared a set of 178 birds and 75 mammals, all in simple outline form. For many years the originals of these were thought by the publishers, the Slingerland-Comstock Company, to have been lost, but when ownership of that company changed, a few years ago, the entire set of originals, except for an inferior picture of a horse, was found. In many cases these were in a sad state, being stained, torn, marked and just plain dirty. Careful attention has restored most of them to a dignity, in part, at least, equal to their real worth.

While the picture of the horse was missing there was one picture found among the originals that never appears to have been published. We take pleasure in presenting it for the first time for use on this page.

The weasel of Fuertes, here shown, has many of the qualities typical of his pictures. It is simple. It seems to present a living, active animal. It has a touch of humor and suggestion of malice, although whether this was intended or not we will never know. It was always fun to watch Fuertes at his work. When he drew a hawk he looked hawky, so much so that one hesitated to interrupt the work for fear of some effective reprisal. On the other hand, when he drew a hummingbird or a warbler, the artist had a most angelic smile on his face and a winning expression in his eyes. Possibly the inner feeling of the artist while he was interpreting his animals found a real expression in the pictures themselves. At any rate it is to be regretted that we have no record of the time when this picture was drawn, of the reason, or of the emotional state of the artist at the time.

We have used Fuertes drawings repeatedly in illustrating the special inserts that have been appearing in *Nature Magazine*. We hope to use others in the future, since we now own the copyright on them. We doubt, however, if any of the series we have is superior to that of the weasel drawing.

The series in line drawings was made primarily for use in the northeastern part of our country. The species chosen were, therefore, for the most part native of that region. However, one part was devoted to domestic animals and another to zoo animals, so we find some of the better-known animals of these groups included. Some of the best are the pictures of waterfowl and game birds. It is greatly to be regretted that the artist could not have lived to complete what was obviously an uncompleted set. While the set includes most of the common owls, it omits the most valuable, the barn owl. While it includes such common species as the English sparrow, it does not include the female of that species.

The set undoubtedly would have been augmented to include vertebrates other than the birds and mammals. Generic representations of snakes, salamanders and turtles were prepared, but they are in no sense comparable with the bird and mammal pictures.

While the bird and mammal pictures were originally published without any text whatever, or with a general text designed to direct observations, texts have been added in more recent years and the complete set is now available, or it may be made up to suit only the particular needs of some class or community. The new text provides space where local observations may be recorded, thus making the record seasonal and personal, as well as integrated with the facts supplied by the studies of the ornithologists and mammalogists. These have found a ready use in schools and camps for students from the elementary grades through the college graduate level. Their sustained sale for nearly forty years speaks well for their ageless appeal.

Moon-Led

By MARGARET S. HOSMER

Now I am moon-companioned this bright night.
When I walk east or south, the moon, ahead,
Moves and allures. But never Lady Light
Lets me catch up with her soft silvery tread
That seems approaching slowly, teasingly.
But when I turn my back, I find this oddity:
If I walk north or west, *she* never catches *me*.

ADJUSTING TO THE WEATHER

(Continued from page 239)

9300 other stations provide weather and river observations used by weathermen in making records and reports. Maintenance of this vast network costs a little more than twenty-two and a quarter million dollars a year, but the work results in the saving of countless lives and billions of dollars.

Private organizations, too, are interested in weather studies. Some of them maintain their own laboratories and scientific staffs. Their researches are often carried on in cooperation with colleges and universities in various parts of the country.

A good example of this is the research on lightning conducted by engineers and scientists of the Westinghouse Electric and Manufacturing Company. To measure the intensity and duration of a direct lightning stroke, the company's engineers have developed a device called a fulchronograph. This is essentially a motor and a slotted aluminum wheel to which fins of permanent magnet steel are attached. The wheel rotates between two coils that carry the total surge of current produced by the lightning stroke. By using several wheels, which spin at different speeds, one stroke or a sequence of lightning bolts can be measured and analyzed.

To hunt lightning, some sixty of these fulchronographs have been mounted in various likely places throughout the country. One such place is atop the 535-foot spire of the University of Pittsburgh's Cathedral of Learning. There, a lightning stroke was measured from the time it reached its crest of 21,000 amperes, until its current fell to zero some 20,000 microseconds (millionths of a second) later. Another fulchronograph has been used to measure the lightning bolts hurtling down twin copper cables on a 585-foot tall brick smelter stack in Butte, Montana. There, one stroke carried current totalling more than 160,000 amperes, while another consisted of twenty-two separate strokes that were hurled from the sky and recorded in less than half a second.

Why play with lightning in this way? Because, since man cannot control the bolts or direct them where he wishes, he must learn about them in order to build better protective devices and design power systems that will be more capable of resisting the lightning's attacks.

After scientists have perfected such devices as circuit breakers and safety fuses, they must test their inventions. To do this, since they cannot command natural lightning, they must create artificial lightning in the laboratory. Westinghouse engineers have done this, too, using artificial bolts amounting to 2,000,000 kilowatts to test circuit breakers that serve as automatic guardians of power lines and power systems.

In a sub-zero laboratory they also have tested outdoor power switches built for use in Alaskan winters. Tests such as these are used to counteract the effects of below-freezing weather on power cables. Ice, as electrical engineers know, reduces the insulating quality of the porcelain in the switches. Thus, insulators on these switches must be made tall enough so that the electricity will not arc, or jump, from contacts to base when the line carries its normal voltage through icy Alaskan winters.

A third Westinghouse development is a current converter that can totally ignore the weather. Perfected after seven years of research, the rectifier can turn alternating into direct current regardless of whether it is immersed in boiling water or packed in ice. This invulnerability to high and low temperatures makes it equally useful in a wide variety of climates. Also, it serves well in airplanes that travel from the heat of tropical landing fields to the intense cold of high altitudes within a matter of minutes.

And so it goes with all manner of rare scientific devices, as well as with everyday things like food shipments, light poles and roof repairs. Since man cannot as yet control the weather to any appreciable extent, he must modify his activities and his works to fit the weather changes.

WILD ANIMAL PARENTHOOD

(Continued from page 247)

of their mothers. Whatever sense of caution they may possess at birth is far outweighed by an innate curiosity in anything that walks or crawls. Giraffe babies in the wild have been known to wander disobediently away from their guardians and to walk up to human beings who have invaded their veldtland nurseries. In captivity a giraffe calf is anxious to get a better look at the specimens of mankind that crowd about its cage. The youngster comes as close to visitors as it can, pressing its gentle face tightly against the wire. Behind, the mother paws the ground with a trembling front hoof and snorts loud and unmistakable warnings. On being totally ignored by her beloved child, she hurtles forward to push the baby to a safe distance by gentle but determined shoves.

No animal mother worries more over the welfare of her young than a giraffe, and surely no baby requires more constant supervision than hers. The giraffe baby makes a poor match for a leopard, a lion, a pack of wild dogs, or any of the other creatures that would welcome a meal of tender young giraffe. Fortunately, a giraffe calf grows rapidly and soon learns that unrestrained curiosity almost invariably leads to trouble. It is taught to use its long neck to best advantage as a watch tower, and that anything seen from this lofty head-level should be considered dangerous until proven otherwise.

In comparing giraffe and condor mothers with the brush-turkey hen, one might be led to believe that the first two are good mothers and the last a poor one. Such is not the case, however, for each mother does only that which is essential to fit her young for the lives that lie ahead of them. Brush-turkey chicks begin their lives richly embued with instinct, while the fur seal baby has little. Brush-turkey children can run and fly almost from the hour of their hatching, while a condor does not grow its flight feathers for several months. With wild animals, just as with human beings, the occurrence of poor mothers is purely an individual matter.

Gadgets

In line with past practice of passing on information about new ideas and products that come to our attention we will list a few more . . . From the Vantage Corporation, West Hartford, Connecticut, comes information that "Dri-Bath", designed to make pet-cleaning a pleasure, will be available through pet shops, kennels and other retail outlets . . . From the Edro Corporation, P. O. Box 584, New Britain, Connecticut, comes "Safe-T-Aid, Jr.", a clever little gadget that hooks over your automobile rear-view mirror and filters the glare from the headlights of the car behind you. It flips up or down as you need it . . . Science Products Company, 1230 East 63rd St., Chicago, Illinois, presents "The Magic Garden", a large-size folder with a story, eight packets of seed stapled inside, a garden plot plan, and some garden advice. It is intended for the youngster and to stimulate a garden interest among boys and girls. Price is one dollar . . . British Industries Corp., 315 Broadway, New York City, announces that, for the first time since the war, the famous Wilkinson Pruning Shears are available to the American gardener.

Louisiana Ornithologists

On December 6, 1947, the Louisiana Ornithological Society was formed to bring together bird enthusiasts of the State and to promote interest in and appreciation of the value of birds, esthetically and economically. Earl R. Green of New Orleans was chosen president; George H. Lowery, Jr., Louisiana State University, Baton Rouge, vice-president; Gladys S. King, 2100 Robert E. Lee Boulevard, New Orleans, secretary-treasurer. All interested in birds are invited to join.

Duck Stamp Sales

Indicative of the heavy hunting pressure on our migratory waterfowl are the figures showing that 2,016,819 "duck stamps" were sold during the year ending June 30, 1947. This broke all previous records, exceeding the 1946 figure by 291,314. The first year in which the stamps were sold—1935—only 635,001 were purchased. Minnesota reported the largest sale with 175,151, with California second with 154,652. Texas and Michigan were in third and fourth position. Sales for the year ending June 30, 1948, are not expected to be higher. Meanwhile the Fish and Wildlife Service is carrying on a survey of migratory birds wintering in Cuba, or passing through that country in their migratory flight.

Yosemite School

Just before going to press we received an announcement of the renewal of the sessions of Yosemite School of Field Natural History, Yosemite Park, California. Space does not, at this late date, permit details about the session of the graduate school for naturalists. Full information may be obtained from the address above.

R. Bruce Horsfall

R. Bruce Horsfall, artist and art editor of *Nature Magazine* for many years, died March 24 in Monmouth Memorial Hospital, Long Branch, New Jersey. Born in Clinton, Iowa, Mr. Horsfall studied at the Cincinnati Art Academy and in Munich and Paris. He painted many notable backgrounds for habitat groups at the American Museum of Natural History and other museums. He illustrated many Nature books, including *Bird and Animal Paintings* published by the American Nature Association. In 1944 Mr. Hors fall retired to devote himself to painting for his own pleasure alone.

P. L. Ricker Retires

After 46 years with the U. S. Department of Agriculture, P. L. Ricker, taxonomic botanist and president of the National Wildflower Preservation Society, retired on March 31. He developed an early interest in science, becoming curator of a boy's museum at the age of 12. He was born in Brunswick, Maine, and attended the University of Maine, joining the Bureau of Plant Industry in 1901, the same year that Bureau was established. Mr. Ricker will continue cooperative work for the Department on wildflowers.

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BATTLEWISE BIRDS

(Continued from page 248)

and American machine-gun, rifle and artillery fire, which made life rather precarious for Nature's inhabitants of the marsh. It was, therefore, not surprising to see a moorhen, which is the European representative of our marsh-dwelling gallinule, wandering haplessly along a wood-bordered, shell-pocked road in high ground about a mile-and-a-half from the swamp. The bird was a perfect example of a pathetic, bewildered refugee wandering aimlessly through a strange country. However, for at least one pair of mallard ducks whose home was the marsh, the continual rattle of small arms fire and whistle and crash of shells failed to disrupt their normal life as they convoyed their brood of seven downy ducklings on a quest for food among the grass tussocks.

Like the mallards, some other birds seemed almost calloused in their indifference to warfare, and even used some of its death-dealing weapons to their advantage. This avian tendency was demonstrated to me at the time of Von Rundstedt's thrust into Belgium in December 1944, which caught the First U. S. Army off guard. My sergeant and I were driving along a frozen, rutty road through the snow-blanketed Belgian countryside under what was then known as the "milk-run route" of the German buzz-bombs, or V-1's. The outboard motor-like sound of a buzz bomb purring overhead on its lethal way to Brussels had become a common daily noise, and was nothing to worry about as long as the motor continued to stutter on. Occasionally a faulty fuel line or other mechanical failure would cause one of these winged missiles to crash and explode many miles short of its intended target.

A magpie was flying parallel to my jeep over a wide, snow-covered field and at the same time I heard a buzz-bomb purring through the air in the vicinity. Suddenly the purring stopped. There was a moment of dead silence during which the two occupants of the jeep dismounted and hit the ditch, breaking all known speed records for such a maneuver. The bomb crashed about seventy-five yards away in the middle of the field with a deafening, earth-quaking explosion, scattering fragments and dirt clods as far as the ditch in which we were tensely reclining. We had no more than picked ourselves up and started over to investigate the 7-foot-deep and 12-foot-wide crater blown into the field, than I saw the magpie fly down to the smoking crater lip. The bird calmly proceeded to turn over dirt clods with its beak, searching for grubs exposed by the blast! Any normal bird would undoubtedly have been badly shell-shocked and, if still able to fly, would have headed for the comforting depths of the nearest gorse bush to recuperate. But not this hungry, battle-wise magpie. He knew there were grubs under the snow-covered, ice-encrusted ground, and here were several larvae-laden square yards of it turned up right under his beak. This was a gift from the gods away from which no such thing as a devastating explosion was going to scare him.

Many birds adapted themselves readily to the war-torn landscape, which provided an abundance of nesting sites. Such birds as the swifts, wheatears and redstarts, the last two species closely related to the thrushes, nested in the cracks, fissures and rubble of bombed buildings. At the airfield in Erfurt, Germany, which was littered with wrecked German aircraft, I found the nest of a white wagtail (a small pipit-like bird) in the broken-off wing tip of a strafed Messerschmidt 109. I found another nest of this species in a shell hole in the side of a German pillbox, one instance where the work of a death-dealing agent provided shelter for new life.

Certainly some of Europe's bird life suffered from the war, but not nearly so much as the mammal population, which, restricted to the ground, suffered much heavier casualties. It appeared that the majority of European birds have adopted, as have most Europeans, a philosophical, fatalistic attitude towards man's all too frequent efforts to obliterate himself.

THE MISSING LINK IN THE CHAIN O'LAKES

(Continued from page 261)

the theory that this would force them to their former activity, raise the water level, and thus reopen the missing link.

The Michigan Department of Conservation, however, is specifically committal in its attitude toward such an undertaking: "Springs characteristically fail during periods of drought because of depletion of the underground water reservoirs. They do not fail because of getting filled up. It would be entirely useless to dynamite or otherwise attempt to open these springs, and this Department has never had any intention of undertaking such action."

Their view of the water situation is revealed in the following: "The history of our inland lakes and other waters since the retreat of the continental glacier many thousands of years ago is in general one of very slowly lowering water tables. . . . Superimposed, however, upon this slow decline is the seasonal and cyclical fluctuation of water levels which are due to variations in rainfall. . . . The length of time between high water periods on the Great Lakes may be five years or it may be fifteen years or any other number of years."

Finally, they give a note of reassurance: "In view of the absence of any artificial conditions which could be tied in with this fluctuation, we must expect that the lakes will return to previously existing high levels within due course of time."

This is certainly reassuring to property owners, fishermen, and boaters. But to a botanist the fascinating flora in the Missing Link Bog seems doomed. Personally, remembering another bog that engulfed a street in one swallow, I'm willing to bet that the Missing Link Bog will continue to sever the Chain O' Lakes and flaunt its vegetative carnivores in spite of man, the elements, or dynamite.

VENUS AT GREATEST BRILLIANCY

(Continued from page 266)

Siam, French Indo-China, eastern China, Korea, Rebun Jima, and the southeastern extremity of Karafuto and several islands in The Aleutians, ending at sunset in the eastern part of the north Pacific Ocean.

Seven groups of scientific observers sponsored by the National Geographic Society and representing the U. S. Army Map Service, Engineers and Signal Corps, Navy, Air Force, Bureau of Standards and Coast and Geodetic Survey, will be stationed along the path of central eclipse at Mergui, Burma; Bangkok, Siam; Wukang, China; Tenan, Korea; Rebun Jima, Japan, and Adak and Kiska in The Aleutians. It will be the object of these expeditions to obtain the contact times of the eclipse with the highest degree of accuracy possible and the exact position of the path of the central eclipse. From these observations valuable data should be at hand for the solution of certain astronomical and geodetic problems, such as the correction to the tabular position of the moon, and improved data regarding the size and shape of the earth.

This May eclipse is remarkable for the narrowness of its path, and for the fact that at one position, near Japan, the vertex of the moon's shadow-cone passes through the earth's atmosphere at a height of about five miles above the surface. Near that point the eclipse may be total in the atmosphere and annular on the surface. On the earth's surface the annulus, or ring of light surrounding the moon at mid-eclipse, may be so thin as to appear practically non-existent. The duration of that phase will be only a fraction of a second at that point and the path less than 100 feet wide. It should be possible, because of the peculiar circumstances of this eclipse, to make some valuable observations where the path is at, or nearly at, its least width.

A number of observers of the eclipse of May 20, 1947, members of the expedition sent by the National Geographic Society to Bocayuva, Brazil, will be members also of the expeditions to Asia and The Aleutians. The expedition last year to Brazil was highly successful and many excellent observations were obtained.

Arranging Flowers

Flower Arrangement: A Hobby for All. By Matilda Rogers. New York. 1948. The Woman's Press. 72 pages. Illustrated. $1.50.

Matilda Rogers holds that flowers are fun but that you are not getting the most out of them unless you know how to put them together to make a lovely, three-dimensional flower picture. So, in this little book, the author presents a series of simple lessons in flower arrangement, practiced as a hobby by flower lovers. The pictures that illustrate the book are all of arrangements done by Matilda Rogers.

Watkins Glen Pictures

This is an anniversary year in the Finger Lakes Region of New York, and Watkins Glen State Park is celebrating its 85th year as a scenic park. In connection with this the Watkins Glen Chamber of Commerce is sponsoring a photographic contest. Many of the scenic spots are a challenge to photographers, being difficult to photograph effectively. The contest is for amateurs, and pictures must be taken within the physical boundaries of Schuyler County, or along the banks of Catherine Creek. Two classes of pictures are provided, one scenic and the other recreational. Full information may be obtained from Secretary, Chamber of Commerce, P. O. Box 243, Watkins Glen, New York.

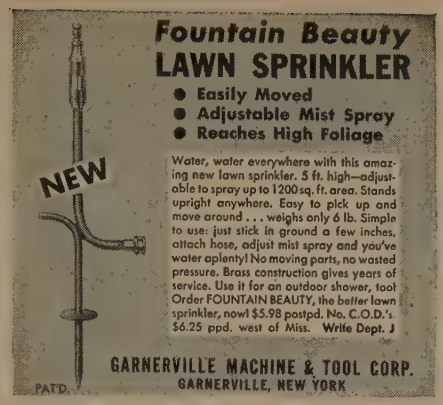
Want to Write Him?

From Hans-Joachim Ruehlmann, 36 Lessingstrasse, Apolda, Thuringia 15a, Germany, Russian Zone, comes a letter saying that he would like to correspond with people interested in the physical sciences. He says: "I am eighteen years of age, a very friend of nature, especially interested in chemistry, going to a Grammar-school, intending to study for medicine. Besides an eager stamp collector, also chess-player. I hope that's enough to find out an address. To get some post from U. S. next time, thus I believe by Your help. I thank You for Your kindness yet before and hope that this letter will run very fast that I soon get respond." This note seemed a good way to make Hans-Joachim's letter to run very fast.

Tiny Library

Tiny Animal Stories. By Dorothy Kunhardt. New York. 1948. Simon and Schuster. Twelve miniature books. Illustrated by Garth Williams. $1.00.

Cute is the first adjective that comes to mind to describe this dollhouse book shelf that should delight any youngster. The publishers have been bringing out "Golden Books" in a variety of sizes, some of them quite large and beautiful. These are quite tiny and beautiful. The text is simple and friendly, and the two hundred color illustrations charming. Yes, it is a cute idea.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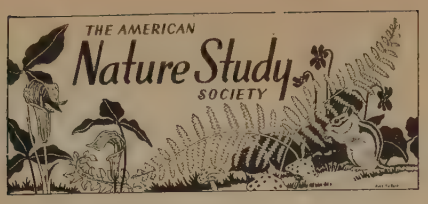

TECHNIQUES FOR GROUP LEADERSHIP DEVELOPED IN THE NATIONAL CAPITAL PARKS

By W. DREW CHICK, JR.
Park Naturalist

In a season's work, the naturalist staff of the National Capital Parks, Washington, D. C., makes some 70,000 personal contacts with the people in this region. These interpretive or educational contacts are made largely during week-end activities outdoors from April through November, week-day outings for children during the summer vacation period, and illustrated school assembly talks. Because the programs are popular, individual Nature outings may be attended by 100 to 250 people. This article deals with the techniques developed.

We are asked frequently: "How can anyone see birds with such a mob to scare them away?" They not only see birds, but they have many opportunities to learn the characteristic features of birds. Before the season starts, representatives of the Audubon Society of the District of Columbia meet with the naturalists of National Capital Parks. On the basis of past experience with birds, locations and dates are "matched" to provide optimum "birding" for the large groups of people anticipated.

These walks are also part of the Audubon Society's program for its membership. When the schedule is prepared, the Society publishes it in the Calendar which appears in its monthly publication, *The Wood Thrush*. It also appears as part of National Capital Parks' "Outdoor Program." Weekly press notices are issued.

Before the season starts, the leaders' committee of the Audubon Society arranges for volunteers to accompany each walk. These individuals are competent field ornithologists who enjoy sharing their knowledge and experiences.

Once the group has assembled for the bird walk at the appointed place and time, the park naturalist explains briefly how the outing will be conducted and introduces the volunteer leaders. He determines by direct questioning—and this requires tact—the proficiency in bird study of the participants and on this basis groups them in parties of like ability. These parties average about thirty people, and are under the direction of a leader and an assistant when available. If organized youth groups such as Camp Fire Girls attend the outing, they are kept together and a leader familiar with their special needs is assigned to work with them. This entire introductory procedure should take less than five minutes.

The parties then start, each following separate, pre-arranged routes designated by the naturalist. The circulation pattern over the area is planned to prevent interference between parties. Each party, by the end of the 1½-hour (or in some cases, 2½-hour) outing has covered all habitats represented and has had the greatest possible opportunity to observe all species of bird life present within the area. As the party proceeds, the leader points out and identifies the birds, calls attention to field marks, songs and calls when heard, and tells something of interest about habits, habitat, feeding, nesting, migration, and the like.

Beginners depend on their leader for careful guidance in learning correct habits of observation. Consequently the leader will spend considerable time on those birds that are seen frequently so that they will be recognized readily on subsequent trips. Advanced birders make a quick inventory of the bird population of the area and then concentrate on the migrants, or other unusual "records."

Each participant is provided with a free "Check List of Birds Regularly Seen in the National Capital Parks." These are distributed by the several leaders in the course of the outing so that the whole group is not delayed at the start. By counting the lists returned by the leader (each one was given a packet) and subtracting this figure from the total distributed, an accurate count of persons participating in the bird walk is obtained.

At the end of the outing, each leader goes over the list with his own party, checking each species seen or heard. During this review, each member of the party may check his own list and thus obtain a personal record of all birds found. Afterward, the leaders consolidate their lists so that a composite record for the area on that date is obtained.

All meeting points selected are accessible by public transportation. Possibly 70% of the group arrive by this means. All bird walks begin at 7 a.m. because earlier "owl" service schedules of buses and street cars are not frequent enough to transport people from all sections of the city to arrive at the meeting places before that hour. The walks are held both Saturday and Sunday mornings through April and May at a different location each day. In September and October, bi-weekly bird outings are scheduled.

On occasion, it is necessary for a National Capital Parks naturalist to conduct a party of more than a hundred children on a two-hour trail trip where wild flowers are the center of interest. In order to do this effectively, it is desirable to establish certain "rules of conduct," which are strongly emphasized at the start of the trip. Children are impatient, full of energy, enthusiastic, but they respond readily to direction. Their attention may be maintained successfully for a two-hour outing over woodland trails.

At the start of the trip, while the group is assembled, the naturalist explains the purpose of the outing and how it is to be conducted. Each "rule" is stated and the reasons therefore are explained.

Rule No. 1: Stay behind the naturalist.

From time to time, we will stop along the trail to discuss a wild flower or some other object. If you go ahead of the naturalist, you may miss one or more of the stops, or you may take the wrong trail at a fork.

Rule No. 2: Follow closely.

By following closely, as the party moves from place to place, you can assemble quickly to hear the explanations given. That way you can learn and see more.

Rule No. 3: Pick up your feet.

The trail is dusty. If everyone will pick up his feet, instead of dragging them, particularly when walking downhill, the walk will be more pleasant for all of us.

Rule No. 4: Stay on the trail.

The pathway is narrow. We cannot walk more than two abreast. Along the edge of the trail grow the very wild flowers we have come to see. If we trample them down we widen the trail and this beautiful woodland park will lose its attraction.

Rule No. 5: Be quiet.

Although our primary purpose on this afternoon's trip is to see wild flowers, we may hear bird songs, or see wild birds and animals that may not be found on other trips. Our chances to observe wild animal life are better when we are quiet.

Rule No. 6: Horses!

When horses and their riders approach along the trail, the naturalist will call "Horses, left" or "Horses, right." That means the group will stop and stand quietly along either the left or right side of the trail, as directed. It is important to stand quietly because a horse may shy and kick if a quick motion is made, or if someone shouts. By everyone standing on one side of the trail, the horses will have plenty of space to pass.

Rule No. 7: Assemble in a semicircle.

The naturalist will select a wide place in the trail whenever we stop so the group may form in a semicircle (indicate by hand motion) around him. In that way all will be able to see and hear. Because many wild flowers are small and grow close to the ground, the naturalist will pick a specimen where necessary and hold it up within view while its features are discussed. In our parks, visitors may not pick flowers; however, in this case, the naturalist will sacrifice just one specimen of certain plants in order to instruct all. If each child picked a specimen of each plant, there might be none left for others.

If these seven rules are remembered, everyone will enjoy the trip fully and learn a great deal more during the two hours. And further, no one will know that so many have been over this trail, for it will remain just as it was before.

These techniques have proved themselves. They work.

THE READER'S MARKET

A place where members of the American Nature Association and readers of Nature Magazine may find many interesting offerings or may advertise themselves, at low cost, for things wanted; things they have for Sale, for Trade, for Sale or Trade. This is an excellent forum for acquiring or disposing of such items as binoculars, books, cameras and photographic equipment, magazines, sports and outdoor equipment, etc.

GENERAL REQUIREMENTS APPLICABLE TO CLASSIFIED ADVERTISING

1. *Transactions based on good faith:* Transactions are based on good faith and mutual satisfaction. Deliberate misrepresentation, disregard of usual business ethics or the attempt to circumvent these general requirements, when brought to our attention, will result in refusal of further advertising.

2. *All orders subject to these conditions:* We reserve the right to edit all copy to conform with our standards and to reject or discontinue any advertisement which we consider undesirable.

3. *Who may advertise:* This department is an open market trading post. Any individual or firm whose advertisement and methods of doing business meet our requirements may advertise their goods or services.

4. *Rates:* All classified advertisements must be accompanied by remittance. The rate is 15c per word including name and address—minimum charge $2.00. Cash with order.

5. *How to count numerals etc.:* Groups of figures are counted as one word. Abbreviations consisting of initials or single characters likewise are counted as one word. Hyphenated words are counted as two words.

6. *"For Sale" ads must state prices:* A specific price must be stated on all FOR SALE ads —except that the phrase "write for catalog" may be used when listing real estate or merchandise in quantities.

7. *Conditions of trade or sale:* The condition of binoculars, cameras, instruments, other equipment useful to outdoor lovers, home-owners, etc., advertised for sale or trade must be specified as follows: PERFECT—meaning factory condition; EXCELLENT—meaning new condition, implying negligible amount of use; VERY GOOD—meaning practically new condition, implying little use, with no appreciable wear and only minor surface scratches or wear; GOOD—meaning moderate condition and with only moderate wear; FAIR—meaning no parts missing necessary to use, reasonable wear inside and out; POOR—meaning marred appearance or badly worn.

8. *Non-specific phrases barred:* Phrases such as "highest" or "top prices paid", as well as any other so-called "auction-type" phrases are not acceptable. The terms "fair price paid" or "state price wanted" may be used.

9. *Blind ads not acceptable:* Box number or blind ads will not be accepted. Give your complete name and address to insure prompt delivery of all mail or telegraph replies.

10. *Requesting privilege of examination:* Purchasers desirous of examining merchandise before acceptance should request shipment by express C. O. D. with examination privilege. This procedure permits the purchaser to inspect the merchandise in local express office and authorizes the express company to return unsatisfactory merchandise at shipper's expense.

11. The association will not accept for publication in NATURE MAGAZINE, advertisements of firearms, ammunition, or patent medicines.

12. *Responsibility for illegible copy:* Type or print advertisement plainly as we cannot be responsible for errors due to illegible writing.

13. *Closing date:* The closing date of all advertisements is the 20th of the second month preceding month of issue.

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BOOKS! Hard-to-find and out-of-print our specialty; All subjects. Send Wants! Jaher Book Service, 620-N East 178th St., New York 57.

FREE BARGAIN CATALOGUE of books. All subjects. National Booksellers. 1182 Broadway, New York 1.

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ADVENTURES IN WILD KNOWLEDGE! Exciting new trails to outdoor science. Adapted to schools, scouts, summer camps. Free samples. Naturegraph Company, 225 Main St., Los Altos, Cal.

"NATIONS IN BIBLE PROPHECY," 25¢. People's Christian Bulletin, Box 87, Cathedral Station, New York 25.

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MISCELLANEOUS

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ART STATIONERY. Piney or Columbine borders. Packet $1.00. Sample free. Nesbit's, Estes Park, Colorado.

PLANTS

QUALITY NATIVE PLANT Seeds, 1947 crop. Cardinal Flower, Turtleheads, Bunchberry, etc., Free List. Valley Gardens, Dept. 1, 21301 Telegraph Rd., Detroit 19, Michigan.

HARDY WILD FLOWERING plants. 50 strong mixed Trillium $2.50. Catalogue. Three Laurels, Marshall, N. C.

POEMS WANTED

POEMS WANTED FOR MUSICAL SETTING. Send poems for immediate consideration. Hamann Service, 590 Manhattan Building, Milwaukee, Wisc.

POULTRY & SUPPLIES

RAISE Fryers new easy way. One-Man Home Plant earns $500 monthly. Booklet Free. Poultry Guild, 1046-K So. Olive, Los Angeles 15, Calif.

SEA SHELLS

SHELLS FOR SALE. Land and Marine; Cape Cod. Special 12 for $1.00 in box; Lists on request. Mrs. F. K. Hadley, Box 33, West Newton, Mass.

BOY-PLANNED VACATION

(Continued from page 264)

ingly black and white, sounded their crowlike calls in the stunted pine on the ascent. Near the top we were level with hawks soaring over the valley. A score or more of strange, sparrowlike birds with a rosy cast to their wings flew within a foot or two of us as we ate our lunches crouched behind boulders on the windswept side of the mountain. They stayed long enough for us to check Peterson; they were Sierra Nevada rosy finches, new to us, but part of this barren area.

We picked out Lyell Glacier, snowy and remote to the south, great blue Mono Lake to the north, and giant, glacier-formed *cirques*, scooped in great bites out of the mountain ranges. It was like changing places in time with Fremont, or Bridger, or Muir, to stand there on top of this new world.

Steeply pitched zigzags, 108 of them, took us down our last lap into Yosemite Valley via the Tenaya Canyon Trail. It was a 2000-foot drop. Our heels ached. We thought longingly of cool shade away from this thick heat and dust. But it did not matter because in another hour we would be at Yosemite Lodge, hunched over milkshakes. In another day we would be starting back East.

We walked 100 miles in all on this special, boy-planned vacation. And it was, for all the misgivings, a new and exciting experience for us both. Accommodations in the camps were not expensive. They ran around $6 a day apiece, which included meals and a box lunch. The cost of the eleven days, with transportation between the Parks, was less than $200. Trails were well marked; the weather was fine.

Fathers and sons have been getting away on camping and fishing trips for years, having rich and memorable vacations together before the boy gets too old to enjoy it. But it should not be dad's prerogative entirely.

Mothers and sons who have not done this sort of thing are missing something. The results of such a trip as Paul planned for us are satisfying and endless. Several hundred photographs went into an album after he developed, enlarged and printed them. Color slides bring the trip back and conversation never lags.

Quite the nicest bit of conservation was something Paul said a month after we returned to Washington. He eyed me with new respect.

"Mom," he said, "I was certainly proud of the way you held together!"

BIG BILL—THE PELICAN

(Continued from page 244)

Hundreds or perhaps thousands of nests are packed so closely together it is almost impossible to walk between them. These are occupied by naked, purplish-skinned young pelicans, so grotesque looking that, in comparison, their parents are positively beautiful! While these unbelievably ugly youngsters poke their greedy bills about, screaming for food and still more food, the mother pelican flutters and fusses awkwardly over them until Pa Pelican comes ashore with a pouch full of fish and does his best to "fill the bill."

Nesting time for the pelicans begins in early spring when they congregate by the thousands on barren, unoccupied islands to lay their eggs and raise the young. As many as 10,000 pelicans have not been unusual in some localities in the past, and at one time colonies numbering 100,000 brown pelicans gathered on islands off the coast of South America.

The nests are crude affairs made of sticks and other debris piled on the ground. There are usually two eggs to the nest, but sometimes three. It takes about a month for the eggs to hatch, and the young are born without a single feather. The young have to be sheltered from the sun by the parents until they are about six weeks old, when their purplish-skinned nudity is clothed with a white fluffy down. They are fed by the mouth-to-mouth technique and help themselves to the predigested fish from the parents' pouch or throat. One of Nature's unsolved mysteries is just how, in such a scene of pandemonium, with thousands of nests and young crowded so densely together, the returning parents can fly unerringly to their own young.

Certain gulls are a source of worry to the pelicans at nesting time. Once the eggs are in the nest these pirates of the air often swoop down upon a rookery with shrill menace and frighten the parents away. The easily alarmed pelicans quickly scatter, leaving their eggs uncovered, and stand meekly by while the gulls raid and plunder one nest after another.

Contrary to the ancient legend that told of mother pelicans pecking open their veins to feed their young on their own blood, pelicans are not always model parents. Parent pelicans have been known to fly long distances from the nest to procure fish for their hungry offspring, yet they will stand meekly by while some marauder raids their nest and destroys the eggs or the newly hatched young. Where most feathered parents usually display almost heroic qualities in defense of their young, the pelican seems to have no conception of his parental responsibilities. Often they have been known to leave their nests until the eggs get cold, and sometimes even roll the eggs out of the nests with their awkward movements and then make no effort to retrieve them.

Now that the esthetic value of the pelican is coming to be more generally recognized and they are under government protection in some places, it is hoped these feathered symbols of the sea and wilderness may be preserved to gladden the hearts of future generations of bird lovers.

All the natural checks to increase, however, have been in operation for ages, yet our pioneers of the West found numerous breeding colonies from southern California north to Great Slave Lake and east to northern Minnesota.

There is little evidence that serious diminution of these colonies was evident until about 1870, but during the next sixty years the destruction or diminution of breeding colonies was increasingly rapid and widespread. In this process drainage and reclamation projects had an important place, but the most potent cause seems to have been the fish-destroying habits, accentuated by those who were willing to place the blame for decreasing angling possibilities on a prominent fish-eating species. As with the gulls, cormorants and herons, sympathy for any creature that subsisted on a food that Nature produced in quantity, and which by reason of its structure must continue on its appointed course, came grudgingly.

The early years of the twentieth century, when sentiment for the protection of our helpless birds received an impetus unparalleled in any time and country, gave little relief to the pelican or any of the fish-eating tribe. Those who engineered the migratory bird treaty were forced to withhold any assistance to the fish-eaters, and any help in their behalf that other Federal or state agencies attempted proved little more than meaningless gestures. Even our National Parks, although there all life is promised sanctuary, have not always seen fit to extend protection to this unique bird. As for the States, one will find it difficult indeed to learn of any worthwhile help that has been offered this disappearing bird. California, originally probably the most abundantly tenanted in the breeding season of any of our States, as late as 1939 specifically listed the pelican as one of the dozen non-game species that were given no protection.

It was not until 1932, apparently, that any attempt was made to make a general appraisal of the status of the white pelican in America. This is our own widest ranging species, and the one best known to Americans and Canadians. This fine study was made by Ben H. Thompson, being Occasional Paper No. 1 of the Wild Life Division of the National Park Service. His map of the former breeding range depicts upwards of sixty areas recorded as harboring breeding colonies since the time of Audubon. Contrasted with this exhibit is a map that shows seven breeding flocks or colonies known to exist in 1932. Four are in the United States, and three in South Central Canada. Thus it is plain that heroic efforts must be invoked, if this unique species is to be retained as a part of our fauna.

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Stoneharbor Sanctuary

Stoneharbor, on the Atlantic in Cape May County, New Jersey, is a municipality with vision. During the past few years, development of the Ocean Drive Highway, land fills and other "improvements" in the County have wiped out a number of heron roosts. These birds, reports Mrs. Florence D. Wood of Upper Montclair, New Jersey, chose, in many cases, to settle in an area almost in the center of Stoneharbor. Mrs. Wood's family has long sought to have this spot preserved because it supports virgin cedars, hollies and grapes on undisturbed dunes, and abundant poison ivy around the perimeter of the spot has discouraged invaders. Adoption of the area by the birds gave it added significance. The land had reverted to the Borough of Stoneharbor because of tax default, so, on the initiative of Stirling Cole, civic-minded, Nature-loving county clerk, a resolution was presented to the Borough Council to set the location aside as a sanctuary. Mayor Biggs of Stoneharbor, a bird student himself, welcomed the proposal, which went through, preserving the area from real estate development, and assuring seven species of herons either a nesting site or visiting place. Many conservation-minded individuals, led by Mrs. Wood's husband, Dr. Horace E. Wood of Rutgers University, urged the favorable action by the Borough Council.

It is now possible to stand on a dune just off a street in Stoneharbor and, from a close vantage point, see the birds come and go. The tract of land is L-shaped, taking in a stretch of beach, and extending two long blocks east and west, and several times that length north and south. A census of the birds is being made, but the complete report does not appear yet to be in. Some 1200 little blue herons have been recorded, however. The Witmer Stone Club will police the area and supervise making the birds visible to the public, thus giving the resort town of Stoneharbor an extra added attraction.

Mineral Resources

Mineral Resources of the United States. By the Staffs of the Bureau of Mines and Geological Survey. Washington, D. C. 1948. Public Affairs Press. 212 pages. Illustrated with maps and charts. $5.00.

In a foreword to this book, Secretary of the Interior J. A. Krug says that while America's mineral outlook is favorable, "it is obvious that a dynamic program of research and exploration must be pursued if new sources are to be developed to supply future needs." As basic to such a program, an exact knowledge of our position as a nation with respect to mineral resources is essential. Hence the stock-taking and appraisal that provides the information for this volume, which is intended as a guide to legislators, producers and consumers of minerals and others concerned with problems of mineral supply.

SMALL ANIMALS

5 CENTS DAY starts $1,000 pair Chinchilla ranching. Complete booklet $1.00. Montana Fur Farm, Billings, Montana.

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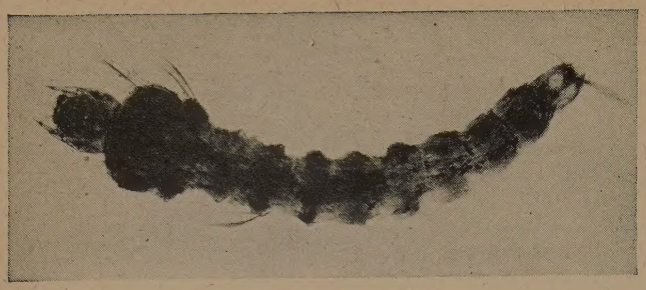
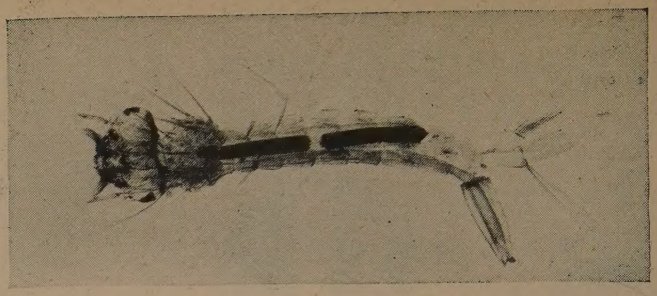


Larva of *Anopheles quadrimaculatus.*



Culex fatigans, larva.

Under the Microscope

By JULIAN D. CORRINGTON

PHOTOMICROGRAPHS FROM SLIDES COURTESY WARD'S NATURAL SCIENCE ESTABLISHMENT, INC.

MOSQUITOES

III. Larvae

One of the tenets in public health problems is that a disease is no stronger than its weakest link; another is that old adage, an ounce of prevention is worth a pound of cure. Malaria, as we have remarked in the first article of this series, affects some three hundred million of the earth's inhabitants, with about eighteen million new cases each year. This dread mosquito-borne disease, the greatest killer of all communicable ailments to which human flesh is heir, can be cured, and a mass of literature has made familiar in recent years the advances shown over quinine by new drugs. None the less, there are many deaths and many stubborn cases, so that mosquito control is more important than drug research, and offers the only hope of complete eradication of the malarias in future years.

Adults of these small flies are kept out of buildings by screening, and may be killed wholesale by the expensive method of spraying DDT from airplanes, whenever the particulars of a case justify such treatment. But these measures are inapplicable to the vast bulk of circumstances. Whether the mosquitoes are dangerous to life and health as vectors of malaria, yellow fever, dengue, or filariasis, or are no more than severe pests, with their poisonous bites, their human victims cannot usually be protected *en masse;* farmers, construction workers, picnickers, fishermen, are examples.

The weak link in the mosquito life cycle, as far as man's ability to break that cycle is concerned, is the larval stage. Everyone who has even the slightest acquaintance with Nature knows the wigglers, or wrigglers, as they are commonly termed. Most of us are quite familiar, too, with the fact that they may be exterminated by spraying breeding sites with oil. Our principal theme this month is to put some detail into the picture of these interesting and highly significant organisms.

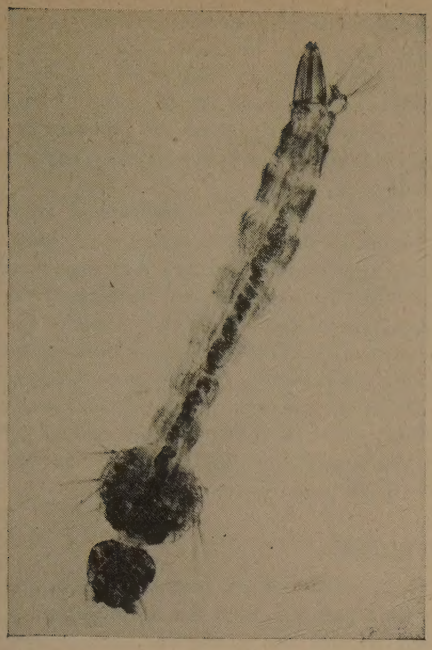
The small animal that hatches from the mosquito egg is the first instar larva, the word *instar* (stage) denoting a period between two successive molts (ecdyses). An insect that undergoes a complete metamorphosis, such as a mosquito, does all of its growing in the larval stage. Since its skeleton is external, growth is only possible during and immediately following a molt, while the skin and skeleton are still soft and flexible; hence insects grow in spurts—a quick growth, followed by a longer period (instar) of stability. Mosquitoes pass through six instars in their lives, four larval, one pupal, and one adult.

Larval mosquitoes feed on plankton and grow rapidly at molting periods, so that the size differences of the four larval instars are considerable. As is true in other animal groups, related species are much more alike in their earlier than in their later stages; hence first instars of different mosquitoes are difficult to tell one from another, and, for purposes of identification and classification of larvae, only the fourth instars should be studied. If earlier instars are collected, keep them until the fourth stage is attained. Mosquitoes in this instar may be known by their larger size, greater hairiness, wider head (as broad as long), greatly constricted neck, and the appearance, especially near the time for pupation, of wing and leg rudiments that are visible through the skin, and of compound eyes.

The fourth instar larvae of mosquitoes in general are elongate, and, although legless, do not otherwise particularly resemble the typical fly maggot. Aside from their greater activity and aquatic environment, the first difference between wrigglers and maggots that would strike the attention is the prominent head of the mosquito larva, with its numerous sense organs, contrasting strongly with the headless maggot. The thorax is a single piece, the abdomen tapers to a smaller diameter toward the rear, consists of nine segments, and, while both head and thorax are depressed (flattened from top to bottom), the abdominal segments become progressively more cylindrical.

The head bears a pair of short, one-segmented antennae, fairly prominent eyes, and mandibulate mouthparts, a feature of which is a pair of bushy *mouth brushes* that sweep food into the mouth. All regions of the body bear hairs that may be simple, branched, plumose, spiny, of various sizes, and either single or in definite groupings. Such descriptions constitute a study known as *chætotaxy,* employed whenever it is found that the arrangement of hairs on the body of an insect has taxonomic value. This is notably the case with mosquito larvae. A great many people would consider the statement amusing, if not absurd, that there are highly educated, serious, mature men, who are paid to use expensive binocular microscopes to count the hairs on a mosquito wiggler's head! These same people would, however, think the matter somewhat less preposterous if the field worker informed them that a designated species of *Anopheles,* infected with a highly fatal form of malignant malaria, was breeding in the pond on the edge of their village.

Since species may be told by their hairs, and since such matters form the basis of technical reports, even individual hairs must be named or numbered, which is certainly carrying anatomical nomenclature close to the limit. Thus, on the head, there may be pre- and post-clypeal hairs, inner and outer clypeals, inner and outer occipitals, antennal and subantennal, and so on. Anopheline mosquito larvae have clypeal hairs, culicine larvae do not; anophelines have palmate float hairs, resembling microscopic palmetto leaves, located near the middle of the



Larva of *Aëdes ægypti*.

back of many abdominal segments, while culicines do not have these.

Most conspicuous of differences between these major groups is, however, the appliance by which the larva obtains its oxygen, involving the eighth and ninth abdominal segments. In anophelines, the eighth segment terminates dorsally in a *spiracular apparatus* that overhangs the terminal segment. There are two spiracles, side by side, surrounded by five flaps; also, on each side and below the lateral flap, is a toothed *pecten*, somewhat fan-shaped. The ninth and final segment is jacketed by a stiff sleeve, the *dorsal plate*, and terminates in four *anal gills*, and dorsal and ventral *anal brushes* of branched hairs. The gills are small and insufficient in both size and number for respiratory needs; hence the wriggler must spend much of its time at the surface, securing air directly through the spiracles. These anal gills are tracheal, not blood gills.

In its undisturbed position—often referred to as the feeding or the resting position, although neither of these terms is necessarily applicable at any particular time—the anopheline larva lies just below and parallel to the surface of the water, dorsal surface upward. The spiracular apparatus as a whole breaks the surface film of the water, and usually a number of the palmate hairs, pecten, and separate hairs of the spiracular apparatus and anal brush are spread out to do likewise and effect a large total area to grip the surface film, bringing surface tension to the aid of buoyancy of the body proper. The larva is thus maintained in horizontal position at the surface, a position that is easily and quickly broken when necessary to escape to the bottom to hide in the litter of the pond floor. These remarkable microadaptations are supplemented by the capacity of the head to rotate through 180° in either direction, enabling the larva to feed on either submerged or floating organisms without changing its posture.

Stained whole mounts of some of these devices make highly interesting slides, if the microscopist has the necessary skill and equipment. Some form of dissecting microscope is essential; some type of mechanical finger will help to hold the specimen while the float hairs are cut off, although not absolutely required. An arranged group of these hairs, tinted lightly with fast green, will repay the effort. If only one or a few of the smallest hairs are mounted, or if no stain is used, then a finder circle, as discussed under *Advanced Hints*, will be needed.

The culicine larva is provided with a *siphon*, projecting away from the dorsal surface of the eighth abdominal segment at about 45° angle, upward and backward. The effect is as if someone had taken the spiracular apparatus of an anopheline larva and pulled it out into a long tube. The spiracles and flaps are now at the tip of this siphon. Only this structure breaks the surface film of the water when the culicine larva is in the undisturbed position, with the result that the larva's body projects head downward in the water at more or less of a 45° angle with the surface. This larva cannot feed on floating organisms, as such an activity would break the respiratory contact. The difference in posture between the two main types of larvae might seem trivial, or of interest only in telling one type from the other at a glance, but in practice it is highly important in control measures. Certain oils, plain or poisoned, when spread over water containing larvae, will kill any type upon contact with the tracheae; but larvicidal dusts, intended to be ingested, will affect only the anophelines.

On the culicine siphon are hairs, hair tufts, and *pecten teeth*, separate structures corresponding to the consolidated pecten of anophelines; on the eighth segment are *comb scales*, with their complex, subdivided teeth, plain or barbed, and the ninth segment varies as to size and extent of the dorsal plate, anal brushes, and anal gills. Again, whole mounts of these separate parts make instructive slides. Entire larvae are not particularly difficult to prepare, the trouble most likely to arise being inclusion of trapped air, as discussed last month in remarks about mounting the eggs.

ADVANCED HINTS

In the feature article on mosquito larvae mention is made of using certain minute objects, as the palmate float hairs, for whole mounts. They will serve here as examples of a large number of miscellaneous materials, each of which presents its own difficulties as to removal or securing, processing, and mounting. However, we are concerned in this account with quite a different matter—the

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problem of finding the structure again once the slide has been finished. If a very small single object, more or less transparent and unstained, is placed alone on a slide, the task of getting it in focus under an objective may prove difficult, time consuming, and extremely annoying. Even groups of such objects, or stained examples, may prove vexatious; also one may wish to find, in short order, some exceptionally fine example.

There are methods of locating the position of an object on a slide by means of coördinate readings on a mechanical stage, or by the use of a microvisor slide, records being then kept for future reference and relocation. At this time we wish to call attention to the simple procedure of inscribing a *finder circle* or *locator circle* at the time the slide is made.

If the nature of the subject permits, make a thin, small circle in the center of a clean slide, using Higgin's American India ink or diluted asphalt varnish. Select a fine pen or brush and draw this circle freehand or with a turntable. Allow the ring to dry thoroughly, then, with a cat's whisker, badger hair from shaving brush, mechanical finger, or similar device, transfer fine insect scales, hairs, diatoms, radiolarians, or other objects to the interior of this circle, then complete the mounting. The circle may be drawn on the reverse side of that used for mounting, if desired, appearing on the bottom of the finished slide; this has to be the case with mounts already made and dried.

Use the following procedure on old slides: with your microscope, find the desired material or object that is to be located by a ring; switch to the lowest-powered objective available and by which the object can still be seen, even though the image is minute; place a tiny spot of ink as nearly over the object as possible. If unsuccessful, wash off the ink and repeat until the spot obscures the object. Allow spot to dry. Turn slide over and draw a very small circle on the bottom of the slide, with the spot, as seen through the glass, as a center. Let dry, turn slide right side up, wash off spot. The circle now shows through the slide and encloses the desired object.

We have often marked our section slides of mitosis and meiosis, as well as blood smears, by this means, locating those rare cells that show some stage or type to perfection. A dissecting microscope, and, most especially, a wide-field binocular microscope, will naturally prove most helpful in this sort of work, but such aids are not essential.

BEGINNER'S PRIMER

Our insect survey comes now to a number of families of flies, none of which are well known to the uninitiated, but which provide excellent and instructive whole mounts for the microscopist. The interest lies in the small size of all of these flies—as minute as 1 mm. in length, with none over 11 mm.—combined with highly specialized antennae, a simplified wing venation, or other structural features, or peculiar habits. Each of these families is cosmopolitan in distribution, and each is moderate as to size, with from one to two thousand species.

The Dance Flies, Family Empididae, are so named because, when mating, large swarms of these gnats hover over a body of water, or in the shade under trees, or, perhaps, beside or over some shrubbery, the whole mass dancing up and down in the air as if motivated by a single brain. They are predacious, capturing small arthropods by pouncing on them, or by trapping with webs. In a number of species whose life histories have been studied in detail, the male courts the female by offering her living victims as food. Some are blood-suckers.

The Family Dolichopodidae includes the Long-legged Flies. While the legs are not proportionately as long as in mosquitoes or crane flies, they are conspicuously so, much longer than in the housefly, for example. The eyes are very large, the thorax bristly, the wing venation very much reduced. Most of these flies are bright metallic green or blue in color although some are somber gray or black. They occur in a wide variety of situations, some species being found in the vicinity of waterfalls, others are noted running over the surface of water and of mud flats, or on damp vegetation, while still others are found in dry localities, as on ordinary foliage or the bark of trees. They are predacious on even smaller insects.

In the Family Phoridae are placed the Humpbacked Flies, known by the strong hump on the thorax, minute size, black or very dark coloration, three-jointed aristate antennae, and character of the wings. When present and well developed, the wings exhibit very prominent radial veins, but elsewhere the venation is scarcely present at all. The modes of life of humpbacked flies are extremely varied: some species dance, like the empids; some are to be found running about over the walls and windows of buildings; others spend their time upon flowers. In still other types, the females are wingless or have greatly reduced wings, and live in the nests of ants or termites.

HISTORICAL OUTLINE

Confirmed readers will recall that our central theme in this series for some time past has been the development of important modern sciences out of the controversy over the old theory of spontaneous generation. Eventually discredited by the work of Pasteur and others, this ancient belief, in giving up the ghost after a millennium of aggressive and embittered struggle, spawned a large family of daughter sciences that constitute the backbone of today's biology, with collateral lines reaching into other fields. The first of these we have traced was bacteriology, and we have seen how Pasteur, Koch, Lister, and their antecedent and contemporary workers succeeded in placing this vastly important study on a firm scientific basis in the last half of the Nineteenth Century. Much of the research since that day has consisted of refinements and additions to the fundamentals laid down by these pioneers.

A second and parallel line of investigation widened the thin pathway of isolated observations into the broad avenue of the science of parasitology. Actually there is no real separation between the two subjects, since pathogenic bacteria are parasites. To be sure, there are harmless and also useful bacteria and, as we have discussed in recent installments of this *Outline*, the science of bacteriology is not confined within pathological chapters. So with animal parasites, there are neutral and beneficial protozoans, worms, and insects. Broadly speaking, parasitology should concern itself with all parasitic species, from all groups of plants and animals; by arbitrary restriction it does not, but deals exclusively with animal parasites.

The word *parasite* means "eating beside, or at the table of, another." Such behavior describes a commensal or symbiont rather than a parasite in the accepted meaning, yet from ancient times the usage for this word has been that of today. Plants do not "eat", your older scientist would argue, so they couldn't be parasites; parasites were animals, large enough to be distinctly visible, as fleas and tapeworms. Not till late in the day were protozoan parasites (animals) and bacterial pathogens (plants) described as such. By that time, parasitology was confirmed by custom as having to do exclusively with animals.

Again, the methods of finding, studying, culturing, identifying, and treating the plant and animal microorganisms developed along separate lines and are usually quite distinct. A student becomes a parasitologist *or* a bacteriologist—seldom both. Although the medical student must take an introductory course in both subjects, other professionals go one route or the other. The cleavage is now so great that in universities one finds separate departments, professors, and laboratories, while in the literature there are separate textbooks, reference works, and journals.